WT-558 (EX)

EXTRACTED VERSION

OPERATION TUMBLER-SNAPPER

Radiological Safety

Armed Forces Special Weapons Project
Washington, D. C.

Nevada Proving Grounds
April - June 1952

December 1952

NOTICE

This is an extract of **WT-558, Operation TUMBLER-SNAPPER, Radiological Safety**, which remains classified **Secret/Restricted Data** as of this date.

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19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report, together with its appendices, was written to reflect the complete picture of the Radiological Safety Group, its responsibilities, organization, operational facilities utilized, and the data obtained during Operation Tumbler-Snapper at the Nevada Proving Grounds in the Spring of 1952.

FOREWORD

This report has had classified material removed in order to make the information available on an unclassified, open publication basis, to any interested parties. This effort to declassify this report has been accomplished specifically to support the Department of Defense Nuclear Test Personnel Review (NTPR) Program. The objective is to facilitate studies of the low levels of radiation received by some individuals during the atmospheric nuclear test program by making as much information as possible available to all interested parties.

The material which has been deleted is all currently classified as Restricted Data or Formerly Restricted Data under the provision of the Atomic Energy Act of 1954, (as amended) or is National Security Information.

This report has been reproduced directly from available copies of the original material. The locations from which material has been deleted is generally obvious by the spacings and "holes" in the text. Thus the context of the material deleted is identified to assist the reader in the determination of whether the deleted information is germane to his study.

It is the belief of the individuals who have participated in preparing this report by deleting the classified material and of the Defense Nuclear Agency that the report accurately portrays the contents of the original and that the deleted material is of little or no significance to studies into the amounts or types of radiation received by any individuals during the atmospheric nuclear test program.

ACKNOWLEDGEMENTS

The excellent advice and assistance of Dr. A. C. Graves, Test Director, Dr. J. C. Clark, Deputy Test Director, and Mr. Duncan Curry, Operations Officer, contributed immeasurably to the success of the Rad-Safe mission during Operation TUMBLER-SNAPPER.

Lt Colonels James B. Hartgering and Paul C. Day, Headquarters, AFSWP, and Major N. M. Lulejian, ARDC, not only participated in the conduct of the Rad-Safe operations, but also assisted in the preparation of this report.

The meteorological data required by the Rad-Safe Group was furnished by Lt Colonel E. H. Karstens, Air Weather Service. The aircraft and crews used in performing Rad-Safe aerial operations were provided and directed by Colonel Kesling and Lt Colonel Storkey of the Special Weapons Center, Kirtland Air Force Base, Albuquerque, New Mexico.

The cooperation and assistance of the above individuals and many others aided in the successful completion of the Rad-Safe mission for Operation TUMBLER-SNAPPER.

ABSTRACT

This report, together with its appendices, was written to reflect the complete picture of the Radiological Safety Group, its responsibilities, organization, operational facilities utilized, and the data obtained during Operation TUMBLER-SNAPPER at the Nevada Proving Grounds in the Spring of 1952.

This report gives in narrative form a general description of the four departments in the Rad-Safe Group; Chapter 6, "Results", contains, in addition to the results obtained in the normal course of operations, a description of several special studies conducted in order to evaluate new techniques, instruments, etc., and to determine radioactive decay rates of residual contamination on the ground. The chapter on "Conclusions and Recommendations" was given careful consideration before inclusion in this report. Notation is made of recommendations still awaiting implementation as differentiated from those which were accomplished during this operation (to June 1952).

The appendices, which contain the bulk of the technical data, present in detail the Rad-Safe data for each of the eight shots in this test series. Many of the operational details have been retained so that the report will be of more value as a guide for future Rad-Safe operations.

As a result of the Rad-Safe operations during TUMBLER-SNAPPER, it was determined that 10 to 20 KT atomic bombs could be detonated from 300-foot towers at Nevada Proving Grounds without creating a radioactive hazard to test personnel or the population in the vicinity of the test site, and without damage to plant or animal life. Computations from the data available indicate that 100 KT bombs could be detonated at scaled heights in the air without creating a gamma ray hazard to the population. Therefore, the limiting factors in this case would be blast and thermal radiation.

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CHAPTER 1

RAD-SAFE GROUP

1.1 GENERAL

Early in the preparatory planning phase of Operation TUMBLER-SNAPPER it was agreed by the Department of Defense and the Atomic Energy Commission that the Department of Defense would supply a team of monitors under the military command of an officer of the Department of Defense, who would report for duty to the Test Commander. Subsequently, under authority of General Order No. 1, Headquarters, AFSWP, Washington, D.C., dated 24 January 1952, Test Command, AFSWP was established and delegated the responsibility of ".....coordinating military participation and assistance in support of the Atomic Energy Commission in the conduct of tests of atomic weapons within the continental United States." General Orders No. 5, Headquarters, Test Command, AFSWP, dated 17 March 1952, established, effective 20 March 1952, the Radiological Safety Group, with Philip S. Gwynn, Lt Colonel, USAF, as director, and placed the Rad-Safe Group under the operational control of the Test Director, Dr. Alvin C. Graves, with the administration and support functions remaining under Test Command. The Test Director's Operational Order 1-52 (TUMBLER-SNAPPER) delegated to the Director, Rad-Safe Group, the responsibility for advising the Test Director on measures necessary to insure the radiological safety of all personnel who might be affected by the test operations, including those individuals not connected with the operations but living in an area up to 200 miles from the test site. In the fulfillment of these responsibilities, the Director of Rad-Safe directed the activities of the Rad-Safe Group and issued appropriate instructions and information to interested parties to accomplish the following tasks:

(1) Provide all ground monitoring services at the test site other than those required for the decontamination of aircraft.

(2) Provide peripheral monitoring by ground and air teams up to a radius of not less than 200 miles from the target area.

(3) Plot and disseminate to interested units the surface and air radexes.

(4) Provide supervision for monitoring and decontamination operations conducted by Project 6.5.

(5) Decontaminate personnel, vehicles, test materiels and equipment at the test site and in the fall-out areas.

(6) Furnish Rad-Safe clothing and other necessary equipment for personnel entering into contaminated areas.

(7) Provide film badge service for all personnel.

1.2 ORGANIZATION

In order to carry out the responsibilities assigned by the Test Director to the Radiological Safety Group, the Rad-Safe Group was organized as shown on the organizational chart, Figure 1.1. This chart delineates the areas of operational responsibilities for the Rad-Safe Group. The immediate area of the site was the responsibility of the On-Site Operations Department. A second area consisting of the territory extending from approximately a 20-mile to 200-mile radius from the test site was the responsibility of the Off-Site Operations Department. In addition, a section was established to operate from Indian Springs Air Force Base in conjunction with the operations of the Special Weapons Center. A fourth section was charged with furnishing the logistical support for the Rad-Safe Group.

1.3 PERSONNEL

The Rad-Safe Group was composed of personnel from the Departments of Army, Navy and Air Force, as follows:

(1) 216th Chemical Service Company, consisting of four officers and 134 enlisted men, from the Rocky Mountain Arsenal.

(2) 17th CTID (Chemical Technical Intelligence Detachment), consisting of two officers and seven enlisted men, from the Army Chemical Center, Maryland.

(3) 995th Quartermaster Laundry Company Detachment, consisting of one officer and 14 enlisted men, from Ft. Devens, Massachusetts.

(4) Five officers and five enlisted men from the Department of the Navy.

(5) Ten officers from the Department of Air Force. (Nine rotated after approximately 45 days with nine other USAF officers.)

(6) Five officers from Headquarters, AFSWP, Washington, D. C.

(7) Three officers and seven enlisted men from Test Command, AFSWP.

1.3.1 Pre-test Rad-Safe Training

A meeting attended by all the Rad-Safe officers present at the site was held on 17 March 1952 to determine the background, experience and capabilities of the personnel of the Rad-Safe Group. Since only a very few of these individuals had ever witnessed an atomic explosion or participated in radiological safety work, a program was set up to provide extensive Rad-Safe indoctrination training as follows:

(1) Organization of the Rad-Safe Group
- Responsibilities
- Operational Procedures
- Supply Procedures
- Security Measures

(2) General Rad-Safe Principles
- Medical Aspects
- Radiation Tolerance Limits
- Personnel Decontamination

(3) Radiac Instruments
- Principles of Operation of the T1B and MX-5 Instruments
- Calibration Methods
- Use of Instruments for Field Monitoring Surveys. (Note: Use of radiac instruments for aerial monitoring was covered separately by the Off-Site Operations Department for designated individuals of this Department.)
- Calibration of Instruments by Each Individual

(4) Familiarization Training
- Rad-Safe Building and Facilities at CP
- Test Site Area Familiarization
- Program and Project Monitoring
- Practice Surveys of JANGLE Area

This training program began on 20 March and continued to the first shot on 1 April. Further group training was also conducted in the two-week interval between the first and second shots. Individual on-the-job training was conducted throughout the remainder of the operation.

1.4 LIAISON ACTIVITIES OF THE RAD-SAFE GROUP

1.4.1 Liaison with the New York Operations Office

The area starting approximately 200 miles from the test site was covered by NYOO. Depending upon the wind predictions on Shot Day minus 1, the representative of the NYOO, Dr. Merril E. Eisenbud, and the Off-Site Rad-Safe Operations Officer positioned monitoring teams so as to bracket the predicted fall-out area. The NYOO secured from the Off-Site Office the actual cloud trajectory data obtained by the aerial terrain survey teams, and used this information to position their air sampling stations. Most of the difficult public relations problems arose from communities greater than 200 miles from the site. Close liaison with the NYOO made sufficient information available so that inquiries from apprehensive communities could be answered with certainty.

1.4.2 Civil Aeronautics Administration Liaison

Liaison was maintained with the CAA representative, Mr. Greenleaf, throughout the operation to insure safety for commercial and other aircraft flying in the vicinity of the test site. The Off-Site Office provided information to the CAA representative which was used to determine the accuracy of the airways closure forecast made on shot day minus one. This information helped reduce the closure time for airways. The radio net available to the CAA was extremely valuable on two of the shots, when the tracking aircraft lost contact with the site. The position of the cloud and other allied data were then relayed through CAA stations.

1.4.3 Liaison with Desert Rock

Liaison was maintained with Desert Rock Operations by attaching an officer from the Rad-Safe Group to Camp Desert Rock as a technical advisor. In accordance with Nevada Proving Grounds Rad-Safe policies, the maximum permissible exposure levels for personnel and tolerance levels for vehicles, etc., were established for Desert Rock in a letter to the Test Command. The Rad-Safe Group furnished Operation Desert Rock with film badges and processed same. Also, a small number of radiac instruments and dosimeters were loaned to Desert Rock. On Shots 3, 4, and 6 the Desert Rock survey monitors made the initial survey with the monitors from the Rad-Safe Group. On Shot 7 the Desert Rock Operation Plan called for an immediate advance following the detonation, and the initial surveying work in their area was accomplished by Desert Rock Rad-Safe personnel. Since the safety of a large number of participating military personnel depends upon a complete understanding of the potential radiological hazards and the proper utilization of physical data, such as weather conditions, winds, etc., a time was established based upon an evaluation of these pertinent factors at which the troop participation operation for each shot would begin. Once this time had been established, the responsibility for accomplishing the exercise in conformance with the established Rad-Safe policies was assumed by the Commanding General, Camp Desert Rock.

1.4.4 Liaison with Program 22 - "Soil Analysis and Fall-out Studies"

Program 22, headed by Dr. Kermit Larsen, UCLA, was a research program to study the phenomenology of radioactive fall-out from an atomic explosion and the composition of the soil at the test site. Since this program and the fall-out monitoring conducted by the Rad-Safe Group had points of mutual interest, the data obtained by both was freely exchanged. The Rad-Safe radio net and the Counting Laboratory were shared by both organizations.

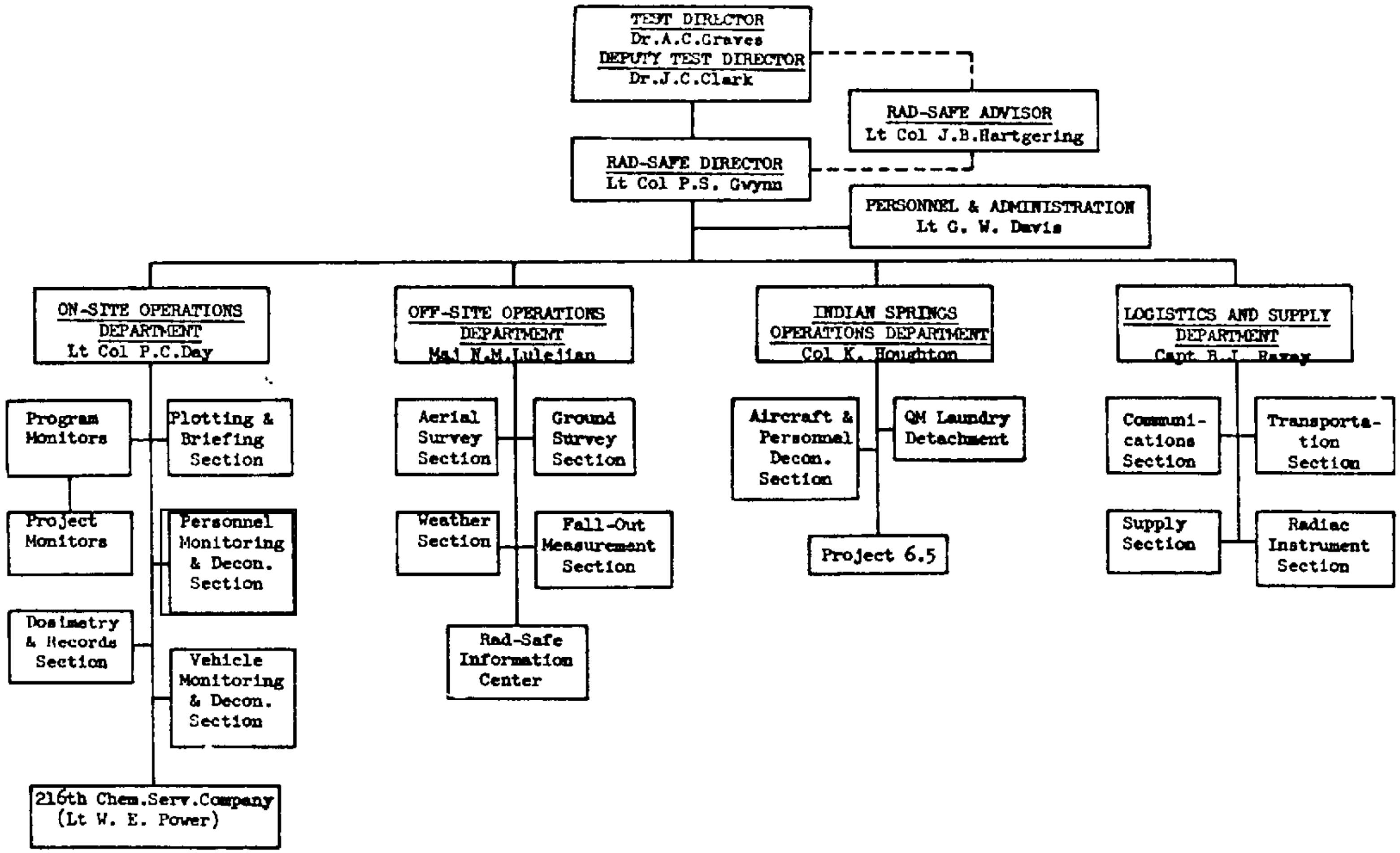


TABLE 1.1 Organization of Rad-Safe Group (TUMBLER-SNAPPER 1952)

1.5 EMERGENCY EVACUATION PLANS FOR OPERATION TUMBLER-SNAPPER

For any operation of this type it is necessary to prepare plans to cope with emergencies. Emergency evacuation plans were prepared and promulgated in three parts by the Test Manager at the Nevada Proving Grounds, as follows:

(1) Emergency evacuation plans for the protection of personnel and materiel outside the Nevada Proving Grounds.

(2) Emergency evacuation plan for the protection of personnel and materiel in Mercury.

(3) Emergency evacuation plan for personnel at the CP and within the immediate test area.

This plan covered the possibility of a radiation hazard occurring in these areas due to unexpected changes in the meteorological condition during the shot period, and also in case trouble should develop aboard the drop aircraft. There was no need during this operation to activate any part of the plan. The emergency evacuation plans are contained in Appendix I.

CHAPTER 2

OFF-SITE OPERATIONS DEPARTMENT

2.1 GENERAL

The mission of the Off-Site Operations Department was to estimate the dosage that would be received in populated areas outside of the site up to a distance of not less than 200 miles, to measure the actual radioactive contamination as it existed in the air and on the ground, and to advise the Director of the Rad-Safe Group on measures necessary to insure the radiological safety of all persons living within this area. A very important part of the Off-Site Operations within the 200-mile area was the establishment of good working relationships with the people in the surrounding areas and nearby towns. Three trips were made to all the towns throughout the area before, during and after the operation. Responsible citizens were contacted, and every effort was made to maintain their good will.

2.2 RESPONSIBILITIES

The responsibilities of the Off-Site Operations Department were to:

(1) Supervise the Off-Site Ground Survey Section, Aerial Terrain Survey Section, Cloud Tracking Section, Radioactive Fall-Out Section and the Information Center.

(2) Measure the radioactive contamination in the peripheral area of the site and prepare information for the Director, Rad-Safe Group, on the radiological conditions affecting the safety of personnel living within this area.

(3) Operate the Rad-Safe Information Center, presenting up-to-the-minute Rad-Safe and allied weather information in a prominent manner, so that key personnel in the Test Director's organization could observe the current radiological situation.

(4) Prepare forecasts of the intensity of radioactive fall-out in and around the site and calculate estimated integrated dosages that may have been received in populated areas within 200 miles of the site.

(5) Determine the air concentration of fission products in this area, as well as the particle size and activity per particle, for the purpose of evaluating the respiration hazard of radioactivity to personnel.

(6) Evaluate the accuracy of the fall-out plots based on forecast winds and the observed winds post-shot, as compared with the

actual fall-out in the air and on the ground as determined by ground mobile and aerial terrain survey teams.

(7) Evaluate the accuracy of forecast cloud trajectories, using the information obtained from cloud sampling and cloud tracking aircraft.

2.3 MONITORING OPERATIONS

The monitoring instruments most often used were the MX-5, Geiger-Mueller Instrument, and the T1B Ion Chamber. These instruments were calibrated by the monitors on each of the three days preceding the shots. To further insure that instruments were in proper working condition at all times, the two instruments assigned to each monitor were returned to the Instrument Repair Shop after each shot and exchanged for instruments which had been inspected and found serviceable. The readings reported by the monitors represented the average of the two MX-5's and/or the two T1B's when they were operating properly.

2.3.1 Ground Monitoring

Each monitoring team consisted of two men. Sedans, carry-alls and half-ton pickup trucks equipped with two-way VHF radios were utilized for transportation. The number of mobile teams used for each shot varied from 8 to 13, depending upon the predicted fall-out pattern. The readings were taken with the probe of the MX-5 held outside the vehicle window (at which time the probe was 4 feet above the ground). As soon as the reading went significantly above background, the mobile teams stopped and monitored the area carefully, holding their instruments approximately 3 feet above the ground, with the beta shield of the MX-5 closed (measuring gamma only). At such time as the intensity rose above 20 mr/hr (the upper limit of the MX-5), the T1B was substituted for the MX-5. Whenever possible, mobile teams kept in continuous contact with the CP via radio. However, in the type of mountainous terrain surrounding the site, this was often impossible (see Conclusions and Recommendations, par. 7.11). In order to improve radio communications, a C-47 aircraft was equipped to act as an air relay station to assist the CP in maintaining contact with the mobile teams. This procedure sometimes increased the communications range approximately 50 to 75 miles, but the results were very inconsistent. Since it is very important to have constant communications with all monitoring teams, the telephone was used whenever the radio communications failed. In general, it was possible, by utilizing both methods of communications, to keep the Rad-Safe Information Center informed of the current data. All mobile monitors kept a permanent log of all their readings, and these readings were subsequently used in computing integrated dosages for all areas of concern.

2.3.2 Aerial Monitoring

In aerial monitoring the instruments used were the MX-5 and T1B, except for the terrain survey aircraft (C-47's), which had, in addition, a B-21 ion chamber instrument and an air sampling device on which a Geiger-Mueller Rate Meter was mounted. The general procedure for the three phases of aerial monitoring is outlined in the following paragraphs.

2.3.3 Cloud Tracking

B-25 and B-29 aircraft were used for cloud tracking. The B-25 aircraft tracked the cloud between 9,000 and 14,000 feet. At these altitudes the aircraft flew as close as possible to the 5 mr/hr intensity line. The angle of approach to the visible cloud was at approximately 45° to the tangent to enable the aircraft to get out of the contaminated area with a minimum of time and effort. The B-29's tracked the middle and upper portions of the cloud at approximately the 2 mr/hr intensity line at 15,000, 20,000 and 25,000 foot levels. Approximately 5 to 10 readings were made at each of these levels to determine the leading edge of the cloud at successive locations. Above 25,000 feet the information from the cloud sampling aircraft was used to determine the position of the atomic cloud.

2.3.4 Terrain Survey

Two C-47 and one L-20 aircraft were used for terrain surveying. One of the C-47's was used for the 10,000 foot level terrain survey, and also as a communications relay station to contact mobile monitoring vehicles that had lost radio contact with the CP. The other C-47 was used for low level terrain surveying at 500 feet. The terrain survey patterns were prepared using the forecast fall-out plot based upon H+1 hour winds. The aircraft were scheduled to arrive at the particular locality approximately one-half hour after fall-out had occurred on the ground to prevent excessive contamination to the aircraft from fall-out and to delineate properly the ground contamination. Special studies were made in an effort to extrapolate the readings taken by the aerial terrain survey aircraft to the actual radioactive contamination as it existed on the ground. The preliminary work along this line indicates that it is possible to determine the ground readings fairly accurately from the air readings, provided the air is completely cleared of radioactivity. The high level terrain survey was used to check the airways closure forecast and to determine the accuracy of the fall-out pattern at the 10,000 foot level. On the day following each shot low level aerial terrain surveys were made in a circular pattern at a radius of 50 and 75 miles about the site to check on any fall-out which may have occurred, and to determine the persistence of the ground contamination previously located on shot day.

2.3.5 Standby Aircraft

At H-12 one L-20 and one C-45 aircraft were kept on stand-by for special Rad-Safe missions. The C-45 was normally used to transport monitors to cities which were from 150 to 300 miles from the site and which were predicted to be in the fall-out pattern or the path of the atomic cloud. The second L-20 was used to augment the work of the low level L-20 and/or to check on additional areas. Past experience has indicated that for air drops at scaled heights, or for nominal bombs on towers, the radioactive contamination beyond a radius of 150 miles is negligible so far as radiological safety is concerned. However, since some of the larger cities have sensitive radiac equipment for the measurement of radioactivity, it was found desirable from a public relations standpoint to dispatch monitors to distant points (150 to 300 miles for the site) where small amounts of fall-out were expected.

2.4 AIR SAMPLING AND FALL-OUT STATIONS

Approximately 18 air-sampling and fall-out fixed stations were used for each shot. These stations were manned and kept in continuous operation for a period of at least 24 hours after each shot. The equipment utilized included MX-5's, T1B's, High Volume Air Samplers, Cascade Impactors, Background Recorders, and fall-out trays. The air samplers were used to measure radioactive contamination of the air, and the filter papers in these high volume samplers were changed every hour and subsequently brought to the laboratory for counting. The Cascade Impactor measured four stages of particle size from approximately 1μ to 50μ. The particles measured by the Cascade Impactor are those which normally float in the air. This impactor does not measure accurately particles with a radii greater than 50μ, but in the range from 1 to 50μ it is believed that the Cascade Impactor gives fairly accurate indications of the particle sizes. The background recorder was used to determine the time of cloud passage and the duration of active fall-out, but the results were disappointing because the background recorders were not sensitive enough to perform the required task. The fall-out trays were used to catch fission fragments that fell out of the atomic cloud. The samples from these trays were later used to make radioautographs prior to ashing and counting. If the assumption is made that activity is proportional to a value between the square of the radius and the cube of the radius of a particle, then it may be possible to determine with a certain amount of accuracy the activity per particle. It was with this in mind that radioautographs were prepared from the fall-out tray samples. It is doubtful whether the results obtained by this method can be used for general application in all areas of the world, since the uptake of activity by the soil particles is apparently dependent upon the type of soil. During the tower shots of the TUMBLER-SNAPPER series, mobile air sampling and fall-out stations were used in addition to the fixed stations to increase the coverage in the path of the fall-out as predicted by the observed winds.

2.4.1 Air Sampling Aircraft

The information required to complete the atomic cloud progression picture at altitudes above the working altitudes of the B-29 cloud-tracking aircraft was obtained from the jet aircraft cloud samples. The jet aircraft were operated by the Special Weapons Center, primarily to obtain samples of the atomic cloud, but they also supplied the Rad-Safe Group with data needed to plot the position of the upper part of the cloud in the region from 30,000 to 40,000 feet.

2.5 RAD-SAFE INFORMATION CENTER

The Rad-Safe Information Center was used to control the mobile monitoring teams. All Rad-Safe and allied weather information was funneled through this section in the CP, where current radiological situation maps of the area were posted. The cloud tracking information was plotted pictorially using the forecast cloud trajectory and the latest patterns of wind flow as a guide. The terrain survey information was plotted on a "station model" basis. Some of the data from the aerial terrain survey were extrapolated to ground readings and these in turn were plotted and checked against the actual ground readings as reported by the ground mobile monitors. As the stake positions and intensities of the 10 mr/hr, 100 mr/hr, 1 r/hr and 10 r/hr lines were received over the radio from the on-site monitors, they were recorded and plotted on the On-Site Target Area Map. The information obtained from the off-site mobile monitoring teams was displayed prominently in tabular form so that it was possible to determine at a glance the radioactive contamination of a given area at a given time. As this information was obtained, the lifetime integrated dose for these areas was calculated and recorded. This was accomplished by using the formula

$D = 5Rt$ where

R = Maximum intensity of fall-out in mr/hr
t = Time of maximum fall-out in hours after detonation has occurred
D = Dose in mr that would be received by persons in this area of fall-out at time t and remaining there throughout their lifetime.

For the purpose of this quick approximation, D was then divided by a factor of two, since the time of maximum fall-out occurred with the time of passage of the atomic cloud, which contributed to the instrument intensity readings. Experience showed that this method gave a fairly good approximation of the actual integrated dose received as determined from the total data obtained and analyzed after each shot. As additional data became available the actual integrated doses were computed and any locations showing possible doses greater than 1.0 r

were called to the attention of the Test Director and/or Deputy Test Director.

2.6 PERSONNEL

On the average, approximately 10 officers and 50 enlisted men were used in the Off-Site Operations Department. The assignment of these personnel was as follows:

(1) Off-Site Rad-Safe Operations Officer and Assistant.

(2) Officer in Charge of Rad-Safe Information Center.

(3) Six non-commissioned officers to plot the incoming data in the Rad-Safe Information Center and present it in pictorial form to all interested parties.

(4) Air Craft Monitors: seven Rated Pilot Officers for terrain survey, cloud tracking, cloud sampling, and standby.

(5) Twenty ground mobile monitors for the ten mobile monitoring teams.

(6) Twenty enlisted personnel to operate fixed air sampling and fall-out stations. (Half of the 18 fixed stations were operated by the Air Weather Service personnel, thus saving the Rad-Safe Group this personnel requirement.)

(7) Four enlisted personnel to operate the two mobile air sampling and fall-out stations.

2.7 TRAINING

In addition to the initial training and on-the-job training given to all monitors prior to the start of operations, the monitors assigned to the Off-Site Operations Department were given special instructions concerning public relations and security. They were also briefed thoroughly in the Standing Operating Procedure pertaining to this Department, and repeatedly drilled in instrument calibration and interpretation.

LOGISTICS AND MATERIEL DEPARTMENT

3.1 RESPONSIBILITIES

It was the responsibility of the Officer in Charge of the Department of Logistics and Materiel during the TUMBLER-SNAPPER Operation to supervise and coordinate all matters pertaining to the functions of the Supply, Communications, Transportation, Dosimetry, and Radiac Instrument Repair and Maintenance Sections of this Department. The Dosimetry Section was transferred on 3 May 1952 from the Department of Logistics and Materiel to the On-Site Operations Department.

3.2 FACILITIES

The entire Rad-Safe Building (Building No. 2 in the CP Area), the Vehicle Decontamination Area and Building, and Rooms 120 and 219 of Building No. 1, Control Point Area, and part of Quonset No. 23, Mercury, were assigned to the Rad-Safe Group. The Rad-Safe Building was used by the On-Site Operations Department, the Logistics and Materiel Department, and by Program 22, "Fall-Out Studies", conducted for the Division of Biology and Medicine, Washington, D. C. Room 120 in Building No. 1 was assigned to the Rad-Safe Director and his staff, while Room 219 was assigned to the Off-Site Operations Department. Early in February, when information was received as to the facilities that would be furnished Rad-Safe, a trip was made by interested personnel to the site to survey these facilities and to determine whether or not there would be additional requirements. Work orders deemed necessary to facilitate Rad-Safe operations were submitted to the J-6 Division of Test Command as a result of this survey. The work orders were processed and some of the work was accomplished prior to the first shot of this series. The work orders included the construction of a radiac instrument calibration and radioactive source storage area, a supply counter, instrument storage racks, signs, benches for shower room, minor modifications of the Rad-Safe Supply Room, and the temporary construction of a a Radiac Instrument Repair Shop. To effect economy in gasoline and maintenance and repair costs, a forward motor dispatch section was located at the CP. A large number of contaminated vehicles were parked in this area to await decontamination or natural decay to prescribed operating levels. The facilities for this area were made available and the dispatch section was established during the last week in April. (See Conclusions and Recommendations, par. 7.6.)

3.3 SUPPLY

It was found that the critical period for the Logistics and Materiel Department was during the initial planning phase prior to the beginning of the operation. During this time it was necessary to anticipate logistical requirements and initiate procurement of all

technical materiel and common supplies necessary to support the Rad-Safe Group throughout the test series. Once these items had been received and accounted for, provision and maintenance of supplies became simplified to following standard issue and return procedures.

In January, 1952 several officers from Test Command made a trip to Los Alamos for a conference with Dr. Graves and his staff. It was resolved at this conference that certain materiel support for Rad-Safe would be furnished by LASL. This materiel consisted of enough protective clothing and equipment (except work gloves, fatigue caps, masking tape, gas masks, film badges and photographic chemicals) to last the entire operation. However, sufficient film badges were provided and processed by LASL for the program personnel of BUSTER-JANGLE who were working in the contaminated areas during the month of March. The Rad-Safe Supply Officer made a trip to the site in the early part of February to inventory and sign for the above equipment loaned by LASL to the Rad-Safe Group. After completion of the inventory, a list was compiled of some 300 line items of additional supplies and equipment that were required for the operation, and turned over to J-4 Division of Test Command for procurement. Radiac equipment, including AN/PDR-T1B Ion Chambers, survey meters, quartz fibre dosimeters, film badges, radiac instrument batteries and repair parts and radioactive sources, was ordered by Lt Colonel Day from various supply agencies through AFSWP supply channels. The six radium sources for calibration purposes were loaned to the Rad-Safe Group by the Bureau of Ships, USN. The remainder of the Rad-Safe equipment and supplies was requisitioned through AF790SO, Indian Springs Air Force Base, Nevada. Although the time was short, the majority of the supplies requisitioned through this channel was obtained prior to the first shot. With the exception of 0 to 1 r and 0 to 5 r quartz fibre dosimeters and a few other items, the instruments and Rad-Safe supplies were found to be adequate throughout the test operations.

A study of the supply procedures to be used was made by the Rad-Safe Supply Officer to determine the number of personnel that would be required. Twelve enlisted men of the 216th Chemical Service Company were assigned to Rad-Safe Supply as follows:

Supply Sergeant
Supply Records Clerk
Supply Warehouseman
Two Receiving Clerks
Truck Driver
Supply Clerk and Alternate Truck Driver
Two Supply Issue Clerks
Two Laundry Room Clerks
Supply Clerk General

It was found necessary to keep the Supply Section open 24 hours a day

for the issue and receipt of protective clothing and equipment, and to stagger the working hours of these personnel to meet maximum load conditions during shot times.

3.4 RADIAC INSTRUMENT REPAIR AND ISSUE SECTION

Two-hundred AN/PDR-T1B Ion Chamber instruments and 90 MX-5 Geiger-Mueller instruments, together with spare parts, repair instruments and tools, and facilities required for maintenance of these facilities were procured. In January, before the beginning of the operation, it was agreed by Lt Colonel Forbes, Director of Program 6, and the Director of the Rad-Safe Group that personnel of Project 6.1, "Radiac Instrument Evaluation", would repair and maintain the Rad-Safe instruments in addition to accomplishing their own project work. Prior to the first shot all the instruments had been placed in working order, and were ready to be issued. During TUMBLER-SNAPPER the switches of all the Rad-Safe T1B's were modified to improve the stability of the meter indicating circuit. This modification consisted of two parts: first, replacing a cam switch with positive-action wafer-type switch, and secondly, eliminating the static potential built up in the range-changing switch caused by friction between moving parts.

The former instrument repair shop located in Building No. 1 during the BUSTER-JANGLE Operation was found inadequate for the following reasons:

(1) This area had been fenced off to permit access to only those persons with "Q" Clearances and Area Passes, which the instrument repair technicians of the Rad-Safe Group did not possess.

(2) It was impracticable to transport instruments between Building No. 1 and Building No. 2.

(3) It was operationally efficient to consolidate in one location the Instrument Repair Shop and Issue Section.

Therefore, before the beginning of operations, the Instrument Repair Shop was moved from Building No. 1 to the basement of the Rad-Safe Building. Due to the short time available to make this change, a temporary electrical wiring system was installed, which, while adequate, should be replaced before the next operation to minimize the electrical hazard. The new location of the Instrument Repair Shop proved feasible, although the space limitation resulted in congestion. (See Conclusions and Recommendations, Par. 7.9.)

3.5 TRANSPORTATION

In a meeting held in Test Command in the latter part of January, it was estimated that 21 vehicles (in addition to the T/O&E vehicles that would be furnished by the 216th Chemical Service Company) would be

required for Rad—Safe operations. Later, due to the shortage in Test Command of heavy vehicles and equipment, part of the 216th vehicles were turned over for use to the Test Command Motor Pool. A breakdown of vehicles actually assigned the Rad-Safe Group is listed below:

Number	Type	Radio Status	Property of:
3	¼-ton Jeep	w/radios	Test Comd.
4	¼-ton Jeep	w/o radios	216th
1	½-ton Pickup	w/o radio	Test Comd.
8	4-door Sedans (Carryalls substituted)	w/radios	Test Comd.
4	3/4-ton Cargo	w/radios	Test Comd.
1	4-door Sedan	w/radio	Test Comd.
3	¼-ton Jeep	w/o radios	216th
2	3/4-ton Cargo	w/o radios	216th
2	2½-ton Cargo	w/o radios	216th
3	2½-ton Decon Trucks	w/o radios	216th

The vehicles listed above represented the minimum requirements for Rad-Safe operations, and when these vehicles began to break down due to the poor condition in which they were received, the roughness of the terrain over which they traversed, and the lack of adequate repair facilities, the Rad-Safe transportation problem became acute. It was necessary during the later shots to obtain six sedans from the AEC and to borrow weapons carriers and jeeps from the Military Effects Test Group to enable Rad-Safe to accomplish its mission.

3.6 RADIO COMMUNICATIONS

Responsibility for this facility was assumed by the Atomic Energy Commission, which let the contract to the Panhandle Electric Company of Amarillo, Texas. Net No. 3, assigned to Rad-Safe, consisted of the following equipment:

1 — 60-Watt fixed transmitter-receiver station, located in the CP Building with radio telephone remote control units installed in the Off-Site and On-Site Offices.

20 — Mobile transmitter-receiver sets, 25-Watt, installed in Rad-Safe vehicles.

1 — 60-Watt transmitter-receiver relay station, installed in a C-47 aircraft.

This net operated through the Spring Mountain Relay Station to the CP. At the beginning of the operation the Rad-Safe Group and the Military Effects Group were on the same net. This arrangement was not completely satisfactory, although Rad-Safe had transmission priority on shot days.

Later, during the course of the operation, the Military Effects Group obtained a net of its own and was separated from the Rad-Safe network. However, at the beginning of the tower shots, Program 22, with 15 additional mobile radios and one radio telephone remote control unit, was placed on the Rad-Safe net. It was soon found that the above VHF system did not adequately fill the radio communications requirements of the Off-Site Operations Department for vehicle-to-vehicle communications and vehicle-to-CP communications at operating distances, although it was satisfactory for On-Site Operations. As a temporary expedient, a two-way VHF FM radio, similar to that installed in the CP Building, was mounted in a C-47 aircraft. The C-47 installation served as an air relay station in place of the Spring Mountain relay to provide communications between the off-site vehicles and the CP Building. In contrast with the automatic relay feature of Spring Mountain, radio traffic by the C-47 was relayed by re-broadcasting. Due to the nature of the terrain and the many "dead" areas in the vicinity of the site, it was often not possible for the vehicles to obtain communication with the aircraft. In addition, the manual relay involved the human error in transmitting and receiving of messages, which in several instances led to errors in reporting data. Later in the operation the equipment aboard the C-47 was modified and an additional transmitter-receiver unit was installed to provide vehicle-to-plane-to-vehicle communications, as well as vehicle-to-plane-to-Spring Mountain-to-CP communications. Again, all relaying of traffic within the aircraft was manual. Although this was an improvement over the previous system, it was never entirely reliable or satisfactory. In the early part of March, 15 hand-carried, portable transmitter-receivers were made available to the On-Site Operations Department. This idea was good, and this type of communications was greatly desired to augment the vehicle mobile radios. However, these radios proved impracticable since the power output was too low to reach the Spring Mountain Relay Station, and they were set aside and never fully utilized during the operations. (See Conclusions and Recommendations, Par. 7.11.)

3.7 LAUNDRY

Laundry for previous operations (Operation BUSTER-JANGLE) was handled by the decontamination laundry located at Los Alamos, New Mexico. This necessitated large stores of protective clothing due to the time required to transport the clothing back and forth between the site and Los Alamos. It was therefore decided that a more efficient laundry system should be set up. Arrangements were made with G-3 of the Army and the Chief of the Quartermaster Corps to have the Quartermaster Corps furnish one section of a laundry platoon for this purpose. A detachment of 14 men, with Lieutenant Chester Carr, Quartermaster Corps, in charge, was assigned to the Rad-Safe Group, and arrived in the latter part of March. This mobile laundry unit was placed in immediate operation at Indian Springs Air Force Base, Nevada, some 45 miles from the CP. It was not feasible to locate a laundry unit closer (i.e., at

the CP or Mercury) due to the water shortage and expense of hauling water from available sources, as well as the lack of a suitable "hot" drainage sump. (See Conclusions and Recommendations, Par. 7.5.) It was therefore necessary to haul protective clothing back and forth between the Rad-Safe Building and Indian Springs. This trip was made on an average of three or four times a week. The laundry unit was set up to wash 400 to 600 pounds of laundry daily if the work load so required. With the amount of protective clothing on hand, it was found that by averaging the peak load it was possible to maintain an adequate supply of Rad-Safe clothing throughout the test operations.

CHAPTER 4

ON-SITE OPERATIONS DEPARTMENT

4.1 GENERAL

The mission of the On-Site Operations Department was to implement the policies, directives and orders of the Director of the Rad-Safe Group to accomplish the following objectives within the target area, including Mercury:

(1) Monitoring of radiologically contaminated areas.

(2) Delineation of radiologically contaminated areas by field surveys, diagramming same by maps, overlays and tabulated reports, and posting appropriate signs to indicate the 10 mr/hr, 100 mr/hr, 1 r/hr and 10 r/hr isointensity lines in the target area.

(3) Briefing of technical recovery personnel on the current radiological situation in the target areas post-shot prior to their entry into these areas.

(4) Monitoring and insuring proper decontamination of personnel returning from contaminated areas.

(5) Monitoring and decontamination of vehicles and recovery equipment returning from contaminated areas.

(6) Providing test personnel with dosimeters and film badges, processing and interpreting the dosage readings, and making permanent records of these data.

4.2 ORGANIZATION

The organization of the On-Site Operations Department is shown in the Organizational Chart, Fig. 1.1. This Department occupied and utilized the major part of the Rad-Safe Building. The initial Officer in Charge of this Department was Lt Colonel L. E. Thompson, who was replaced by Lt Colonel Paul C. Day on 3 May 1952 for the remainder of the Operation.

4.3 FUNCTIONS

The On-Site Operations Officer's functions were as follows:

(1) Overall supervision, direction and control of activities pertinent to On-Site Operations.

(2) Assignment of personnel to specific duties within the Department.

(3) Coordinating through the program monitors with the program leaders to determine the anticipated Rad-Safe requirements of the recovery parties of the various projects assigned to collect technical data.

(4) Assignment of Rad-Safe monitors to accompany technical recovery and field working parties into the contaminated areas.

(5) Provide final Rad-Safe clearance for recovery and work parties into these areas.

4.4 PLOTTING AND BRIEFING SECTION

The Plotting and Briefing Room served as the information center for all on-site field operations. It was the function of the Plotting and Briefing Section to:

(1) Brief the initial post-shot survey teams and prepare the base map of the target areas, indicating the locations of pertinent test data collecting stations, and the permanent access roads, as well as the eight radial lines of numbered wooden stakes centered on ground zero and oriented toward the eight principal points of the compass.

(2) Receive from the post—shot initial survey teams by radio their reports on the locations of the 10 mr/hr, 100 mr/hr, 1 r/hr and 10 r/hr and/or ground zero readings, with reference to the numbered stakes.

(3) Tabulate the readings received from the survey teams and use these data to plot and delineate on map overlays the radioactive isointensity lines.

(4) Brief and assign the Rad-Safe check point personnel to their designated posts.

(5) Brief all technical recovery parties and their assigned Rad-Safe monitors on the current radiological situation in the target areas prior to their departure into the field.

(6) Prepare for submission to the Director of the Rad-Safe Group and to the Off—Site Operations Officer daily tabulated reports and map overlays showing the current radiological contamination levels in the test area.

(7) Dispatch and control all vehicles assigned to the On-Site Operations Department.

4.5 PERSONNEL MONITORING AND DECONTAMINATION SECTION

The functions of this Section were:

(1) Monitoring of all personnel returning to the Rad-Safe Building from contaminated areas, and insuring that those with levels of radioactive contamination above the established limits performed personal decontamination.

(2) Insuring that all contaminated protective clothing was properly turned in to the Rad-Safe Supply personnel stationed in the Personnel Decontamination Area for this purpose.

(3) Re-monitoring of all individuals, after showering and scrubbing decontamination, to insure that all traces of contamination had been removed.

4.6 VEHICLE MONITORING AND DECONTAMINATION SECTION

This Section operated in a specially prepared area just east of the Rad-Safe Building and performed the following functions:

(1) Monitoring of all vehicles and recovered equipment and materiel brought to the Decontamination Station from contaminated areas.

(2) Detention for decontamination or natural decay of all such vehicles and equipment indicating intensities higher than 2 mr/hr, gamma only, as read by an MX-5 Geiger-Mueller Counter with the probe held approximately 4 to 6 inches from the surfaces being monitored.

(3) Decontamination, as required and feasible, of vehicles and equipment above tolerance levels after vacuum cleaning, brushing, washing with clean water, hot water and detergent, or with high pressure steam and detergent.

(4) Release to authorized parties of vehicles and equipment successfully decontaminated to below-tolerance levels, and detention for radioactive decay of those not responding to the above decontamination procedures.

(5) Release for removal from the CP Area, upon direction of the Director, Rad-Safe Group, of vehicles and recovery equipment still above tolerance levels when specifically requested by the Director of Military Effects Test Group or Weapons Development Test Group.

4.7 DOSIMETRY AND RECORDS SECTION

Prior to the beginning of Operation TUMBLER-SNAPPER The Rad-Safe Group was servicing daily a maximum of 112 persons who were engaged in the final phases of Operation JANGLE. During this time film badges were supplied by the Health Division of Los Alamos and were returned there

for processing. In the latter part of March the photographic processing equipment in the Rad-Safe Building was placed in operation with the help of Mr. William DeAlva from Los Alamos. From that time until the conclusion of the TUMBLER-SNAPPER Operation this Section, consisting of one officer and 18 enlisted men, processed all film badges for all test participants, including Camp Desert Rock and the official and technical observers' programs. Two working shifts were set up, one crew working on the day shift, the other crew taking over the night shift, to perform the work of this Section. The 50,000 conventional film badges initially procured for the TUMBLER-SNAPPER Operation arrived by 15 March. An additional 15,000 such film badges procured after the start of the TUMBLER-SNAPPER Operation arrived at NPG in April. Film badges were calibrated and processed by standard techniques daily and made available by 0800 hours the following day to provide the Director of Rad-Safe with the cumulative dosages prior to the re-entry of persons into a contaminated area.

This Section performed the following functions:

(1) Procuring from the Rad-Safe Supply Officer for re-issue to authorized test personnel dosimeters of various ranges and film badges.

(2) Proper calibration of dosimeters, charging these dosimeters to zero reading prior to issue, and reading and recording the indicated dosages upon their return to the Dosimetry Section.

(3) Processing of all Rad-Safe film badges upon their return to the Dosimetry Section, reading their optical densities by means of properly adjusted photo densitometers, and converting these optical densities to dose readings from previously prepared calibration charts. A permanent record of these dosage readings was made against the individuals' names and organization.

(4) Daily preparation, for submission to the Director of the Rad-Safe Group, of integrated dosage reports showing each individual's name, grade and organization, and indicating by red underscore all individuals who had exceeded a total integrated dose of 2 r.

4.8 OPERATIONS

The general operational procedures followed by the On-Site Department throughout the TUMBLER-SNAPPER Test Series was established in the Standing Operating Procedure for the On-Site Department. For the first four shots the Dosimetry and Records Section was under the supervision of the Logistics and Supply Department, and for the last four shots this Section was placed under the direction of the On-Site Department. The SOP mentioned above was amended 3 May 1952 to reflect this change of responsibility. Actual operations performed by the various sections

of the On-Site Department are covered by the Appendices for each shot. For convenience in considering the pre-shot planning and preparation for the shot day operations and the subsequent operations after each shot day, the appendices cover the following periods of time:

Appendix A:	29 March (AX-1 Day) to 14 April (B-1 Day) 1952
Appendix B:	14 April (B-1 Day) to 21 April (C-1 Day) 1952
Appendix C:	21 April (C-1 Day) to 30 April (D-1 Day) 1952
Appendix D:	30 April (D-1 Day) to 6 May (E-1 Day) 1952
Appendix E:	6 May (E-1 Day) to 24 May (F-1 Day) 1952
Appendix F:	24 May (F-1 Day) to 31 May (G-1 Day) 1952
Appendix G:	31 May (G-1 Day) to 4 June (H-1 Day) 1952
Appendix H:	4 June (H-1 Day) to 9 June (H+3 Days) 1952

CHAPTER 5

INDIAN SPRINGS OPERATIONS DEPARTMENT

The detailed report of the operations of the Indian Springs Rad-Safe Operations Department during TUMBLER-SNAPPER may be found in the Special Weapons Center Report for this Operation. Because of the special nature of its mission, this Department, capably supervised by Colonel Karl Houghton and his assistant, Major Mitchell, from the Special Weapons Center, operated practically independently, although it followed the prescribed Rad-Safe Standing Operating Procedures established by the Rad-Safe Group.

CHAPTER 6

RESULTS

6.1 GENERAL

The results outlined in the following paragraphs pertain in general to the Rad-Safe Group operations during Operation TUMBLER-SNAPPER.

6.1.1 Enlisted Personnel as Monitors

It was demonstrated conclusively during this Operation that enlisted monitors who have had no formal training in radiological safety work can perform field monitoring duties adequately if they are given approximately two weeks of extensive indoctrination training in Rad-Safe principles and the use of radiac instruments. It was also found that there was sufficient opportunity during the test operations to give these monitors additional on-the-job training to improve their abilities in this type of work. A more extensive period of radiological safety training was necessary for those individuals who were to perform specialized monitoring (e.g., aerial, off-site and air sampling).

6.1.2 Radiac Instruments

The T1B's and MX-5 radiac instruments were found satisfactory as field monitoring instruments provided they were properly maintained and calibrated. The T1B was particularly satisfactory to determine integrated doses (see par. 6.2.5) from the monitoring logs, provided the readings were taken at frequent time intervals.

6.1.3 Radio Communications

The VHF radio communications system was not satisfactory for off-site purposes. As a result of recommendations made to the AEC Communications Section some improvement of these communications was made during test operations. However, the primary result of these recommendations was the initiation of an extensive survey at the conclusion of the operation to investigate this problem. Preliminary reports from this survey indicate that the installation of a repeater station on the mountain west of the CP will materially improve the range of coverage for the mobile radios for the Off-Site Department, and will enable the use of portable transceivers within NPG.

6.1.4 Location of Maximum Intensity of Fall-Out

It was determined that there is a definite relationship between the particle size of the soil of the NPG and the location of the maximum intensity of fall-out in the surrounding areas. A study of the

monitors' logs indicates that the maximum intensity of fall-out from the four tower shots of TUMBLER-SNAPPER occurred in approximately two hours after detonation. Using the simple Stokes Law relation, it is found that a sand particle of 100 to 150 microns will fall through 25,000 to 30,000 feet in approximately two hours. Reports of analyses of the soil in the NPG indicate that the particle sizes are distributed about a mean of 125 to 150 microns. It was also found that it is possible to determine the position of the maximum intensity of fall-out using normal fall-out plots. An attempt is being made at this time to determine the various levels of intensities of fall-out with their direction and distance from ground zero.

6.1.5 Evaluation of Air Sampling Data and Techniques

In a preliminary study of the reports of the Air Sampling and Fall-Out Unit, it was indicated that all air drops of nominal bombs were marginal when compared with the radiation inhalation tolerances established by the JANGLE Feasibility Committee. Since this was not in agreement with medical and other related data obtained during previous test operations, an investigation was made of the techniques employed by the Air Sampling and Fall-Out Unit in collecting the data and computing the results. The investigation revealed the fact that this Unit used a constant extrapolation factor based on the assumption that fall-out is only a function of distance from zero point. To test the accuracy of this assumption the filter papers in the high volume samplers were changed every hour instead of every 24 hours. The results obtained by this new procedure showed beyond any doubt that time of fall-out actually is not a simple function of distance, but is a complex function of many parameters. The new method showed that the use of a constant extrapolation factor may have produced errors in results obtained by the 24-hour sampling by a factor of 5 to 10, possibly so great as to mislead medical personnel into evaluating the existence of a radioactive inhalation hazard where no such hazard existed.

6.1.6 Workload of Monitors

Near the end of the Operation a heavy drain was imposed upon the remaining number of available field monitors by a combination of the following factors:

(1) A limit of 3.0 r total integrated dose for all test participants.

(2) A considerable increase in the number of technical recovery parties beyond that anticipated by the programs.

(3) The high levels of residual radioactive contamination produced by five of the eight shots.

6.2 SPECIAL STUDIES

Appendices A through H contain the general technical data for the four air shots and four tower shots of the TUMBLER-SNAPPER Operation. The following paragraphs show the results of special studies of Rad-Safe problems. The calculations in these studies were based upon data extracted from Appendices A through H.

6.2.1 Lifetime Integrated Dosage Around NPG

Significant fall-out occurred in only the following three populated areas around NPG: Lincoln Mine - lifetime dose, 2.25 r; Ely, Nevada - lifetime dose, .5 r; and Groom Mine - lifetime dose, 1.75 r. The lifetime doses in all other populated areas did not exceed 75 mr. The upper and lower Pahranagut Valleys in the Hiko-Alamo area did not receive more than 50 mr lifetime dose. Some relatively high lifetime doses were received in the vicinity of Reed, Nevada (3 r), but there was no habitation at this location. There was slight radioactive contamination, with a maximum of 0.6 microcuries per liter of water, in some of the water holes occasionally used by cattle north of NPG. However, an analysis of the water in these areas showed the activity significantly below the tolerance value of 3.5 microcuries of beta emitters per liter of water at all times. (See par. 6.2.2) In the course of determining the external doses to personnel subjected to radioactive fall-out, it was found that the dose could be reduced by a factor of 2 to 3 if the personnel remained indoors. For these measurements a large number of film badges were exposed, both indoors and outdoors, at each location, for the same periods of time. (The life-time doses listed herein were from outside measurements.)

Lincoln Mine (Shot 5)

The radioactive contamination at Lincoln Mine, Nevada from Shot 5 fall-out gave 935 mr integrated dose up to 1850 hours, 7 May 1952, which was 14 hours and 15 minutes after H-hour. The basic information on which the calculations were made is included in the Ground Mobile Monitors' Logs for Shot 5. (See Table E.1.) It was calculated that the integrated dosages for these periods of time were as follows:

Dose in 24 hours	960 mr
Dose in 10 weeks	1750 mr
Dose at infinity time	2250 mr

The decay rate at Lincoln Mine follows the $t^{-1.2}$ relation rather accurately. The 24-hour air concentration of radioactivity at Lincoln Mine was approximately 0.06 $\mu c/m^3$ of air. It was estimated that the mean particle size was greater than 50 μ. The above-mentioned air concentration at Lincoln Mine was less than the tolerance value set up by the JANGLE Feasibility Committee by a factor of over 1000.

Ely, Nevada (Shot 5)

Dose in 24 hours	150 mr
Dose in 10 weeks	280 mr
Dose at infinity time	500 mr

The dosages mentioned above are based on the data in Table 6.1. In making these calculations it has been assumed that the cloud passed over Ely, Nevada at 0710 hours, 7 May 1952, that the fall-out began at 0800 hours, and that the fall-out stopped at approximately 1600 hours. The maximum reading indicated at 0815 hours in Table 6.1 cannot be used to estimate integrated dosage because this was the period of active fall-out and cloud passage. It has been assumed that at 0815 hours (H+4) 10 mr/hr was due to cloud passage and fall-out, and 20 mr/hr was the dose rate on the ground itself. Therefore, the $t^{-1.2}$ relation is used, assuming 20 mr/hr at H+4 hours.

Groom Mine (Shot 6)

Dose in 24 hours	850 mr
Dose in 10 weeks	1500 mr
Dose at infinity time	1750 mr

The dosages mentioned above are based on the data in Table 6.2. The decay rate follows the $t^{-1.2}$ relation very closely. The 24-hour average air concentration of radioactivity at Groom Mine was approximately $0.06\mu c/m^3$ of air, with the maximum reaching as high as $0.363 \mu c/m^3$ of air, which occurred between 0600 and 0700 ($H+2\frac{1}{2}$ hours). The mean particle size was approximately 3μ. The air concentration at Groom Mine was well below the tolerances set up by the JANGLE Feasibility Committee.

TABLE 6.1

Readings at Ely, Nevada, Shot 5 (7 May 1952) - Monitor: Cpl I.O.Elge

Date	Time (PST)	Readings in mr/hr (3' above ground)
7 May	0730	10
7 May	0750	18
7 May	0800	27
7 May	0815	30
7 May	0845	28
7 May	1030	14
7 May	1130	12
7 May	1330	8
7 May	1600	7
7 May	1800	5
7 May	2100	5
8 May	0500	1.7

TABLE 6.2

Readings at Groom Mine, Nevada, Shot 6 (25 May 1952) - Monitors: Cpl Raymond Stattel and Pfc Charles Huffman

Time (PST)	Reading (Mr/hr)	Remarks	Time (PST)	Reading (Mr/hr)	Remarks
25 May					
0400	.02		1015	50	
0430	.02		1030	50	
0500	.02		1045	50	
0520	.1		1100	46	
0525	8		1115	44	
0530	10		1130	42	
0535	30	Started raining.	1145	42	
0540	110	Light Shower.	1200	41	
0545	140	Rain stopped.	1215	41	
0550	155		1230	40	
0600	170		1245	40	
0605	180		1300	36	
0610	185		1330	28	
0615	190	Checked setting	1400	26	
0620	150	change from 190	1430	24	
0625	160	to 150 (40)	1500	22	
0630	155		1530	21	
0635	150		1600	21	
0640	145		1700	20	
0645	140		1800	20	
0650	130		1900	18	
0655	130		2000	18	
0700	130		2100	17	
0705	130		2200	16	
0710	125		2300	15	
0715	125		26 May		
0725	125	Ground breeze	0630	14	
0735	140	from NE to SW	0730	12	
0740	135		0830	10	
0750	120		0930	9	
0800	100		1030	8	
0815	90				
0830	70		27 May		
0846	80		1010	6	
0900	70	Started raining			
0915	60	at 0850 -Stopped			
0930	60	at 0900	28 May		
0945	50		0932	2	
1000	50				

6.2.2 Water Analysis

Reference is made to the University of Rochester Report UR #180, "Use of Commercially Available Portable Survey Meters for Emergency Fission Product Monitoring of Water Samples", by J. B. Hursh, S. Zizzo and A. H. Dahl, dated August 3, 1951. This report gives a rapid and simplified method of using commercially available survey meters to measure beta activity in water. Since the MX-5 instrument was not included in this report, Dr. Hursh, upon request, prepared a special study using the MX-5 instrument. This method consisted of placing the Geiger-Mueller tube with the beta shield open in a specially designed water container so that the same conditions of geometry were obtained as in the initial calibration of the MX-5 with known specific activities of water samples. Figure 6.2 indicates the beta concentration of P^{32} in μc/liter of water versus mr/hr instrument readings for the MX-5. It was assumed that the safe concentration of beta activity in water is 3.5 μc/liter, as indicated by the Department of Biology and Medicine, Atomic Energy Commission, Washington, D. C. During the TUMBLER-SNAPPER series of test operations, water samples were collected from the Pahranagat Valley, Groom Mine, Groom Lake and all the water holes in the vicinity of Groom and Lincoln Mines. None of the above samples approached the concentration tolerance limit mentioned above. Although the great volume of water in Lake Mead gave assurance that no measureable concentration of fission products from fall-out would exist in it, samples from the Lake were nevertheless collected and measured. Needless to say, nothing above background could be detected. The water holes used by cattle and the water sources for people in the periphery of the Nevada Proving Grounds were very closely monitored, since in this type of terrain evaporation tends to reduce the water volume, thereby increasing the specific activity. The drinking water sources at Groom and Lincoln Mines were observed very closely because of the relatively large fall-out during Shot 5 at Lincoln Mine and Shot 6 at Groom Mine. However, again the contamination was much less than the tolerance figure.

6.2.3 Relative Merits of the B-21 Atmosphere Conductivity Instrument, Filter Box Rate Meter, and Geiger-Mueller Type Instruments

The low level C-47 terrain survey aircraft was equipped with the B-21, MX-5, T1B Ion Chamber and a filter box rate meter. The filter box rate meter consists of an air filtering device designed to collect radioactive particles on filter paper which is continuously monitored by a Geiger-Mueller Counter* as the aircraft passes through contaminated air. Ideally, the filter box rate meter should indicate only

*Note: The B-21 gear and the filter box rate meter were made available to the Rad-Safe Organization by AFOAT-1.

contamination in the air, while the B-21, due to its longer sensitivity range, should indicate a reading whether the radioactive material is in the air or on the ground. If the filter box rate meter and the B-21 give simultaneous readings above background levels, the contamination is in the air; but if the filter box rate meter indicates approximately background level while the B-21 is indicating significant readings, the contamination is on the ground. By this method it was possible to delineate areas where the fall-out had occurred, so that the off-site ground mobile monitors could concentrate their attention on these particular areas of importance. This method proved very successful. It resulted in a considerable saving of man-power and the collection of more data than would have been possible otherwise.

The MX-5 and the T1B gave indications similar to the B-21. These two instruments were taken along as a safety precaution in case of the failure of the B-21 gear; but at the same time, an effort was made to secure quantitative results of relative intensities versus altitude.

As an illustration of the type of instrument responses obtained, a plot of the various instrument readings versus time of readings (i.e., location of aircraft) taken during Shot 7 is presented in Figure 6.3. This indicates that the contamination was in the air, and this was verified by the ground monitors, who found no contamination over the positions indicated. Again, Figure 6.4 is a plot of the instrument readings versus time for position of aircraft for Shot 8. This indication that the contamination was on the ground was verified by the ground monitors who surveyed these areas.

In testing the limitations of this method, a C-47 was flown over areas of very high radioactive intensities within the Nevada Proving Grounds. It was observed that the filter box rate meter recorded high although the air was known to be free of contamination. It is believed that this minor discrepancy can be corrected by the addition of more lead shielding between the Geiger-Mueller tube of the rate meter and the ground, so that effectively the Geiger-Mueller tube will be exposed to only that radiation coming from the filter paper.

6.2.4 Aerial Survey of Ground Contamination

A series of experiments was conducted to determine the feasibility of using aircraft equipped with MX-5 and T1B radiac instruments to perform aerial monitoring surveys of radioactive contaminated ground areas. An L-20 and a C-47 type aircraft were flown at various altitudes over areas of known intensities while the monitors read and recorded the instrument readings. An analysis was made of these data and it was found that the readings formed a family of curves of relative intensity versus height above terrain that were accurate to within plus or minus 20 per cent up to a height above terrain of 1000 feet. Examples of the method of using these curves are shown in Figure 6.5.

It is suggested that this method be further investigated during future tests, and if the results continue to be as satisfactory as indicated above, it would be possible to replace a large part of the off-site ground mobile teams by a much smaller number of aerial surveying teams. It was observed during this series of experiments that there is one significant disadvantage to this method. If there is radioactive contamination in the atmosphere, the instruments aboard the aircraft will indicate this contamination rather than the contamination on the ground, which is negligible in comparison except when the ground intensities are very high. However, if the aircraft are scheduled to accomplish these surveys after time has been allowed for cloud passage and fall-out to occur, the method should prove very advantageous in that a large area could be covered in a relatively short time with reasonable accuracy. It should also make it possible to survey areas that are not readily accessible to ground mobile teams.

6.2.5 Dosage Determined by Integration of Instrument Readings as Compared to Dosage Indicated by Film Badges

In this special study an attempt was made to determine the feasibility of using instrument readings taken by ground monitors to determine total integrated doses. For example, during Shot 5 a ground mobile survey team was sent through an extensive contaminated area in a carryall travelling between 25 and 30 mph. The monitors were directed to take continuous readings, using the MX-5 and T1B while enroute. The Mobile Monitor's Log is inclosed as Table 6.3. The information contained in the log was used to prepare Figure 6.6. The integrated dose as determined from this graph was 2850 mr. The dose indicated by the average of the film badges carried by the monitors was 2792 mr. On many occasions when this type of comparison was made the integrated dose as determined by the Mobile Monitor's Log compared very favorably with the film badge reading, except in areas of active fall-out of relatively large particles (greater than 50μ). In these areas the film badge readings were consistently higher than those indicated by the dosimeters carried by the monitors or the doses indicated by the integration method mentioned above. Some film badges exposed to excessive fall-out showed spotty areas of high optical density. It was determined that these high readings were due to fission products which lodged on the outer plastic cover of the film badges. During Shot 6 some film badges were placed out of doors on edge, and others were placed in a position parallel to the ground (Groom Mine, Nevada). In several instances the film badges placed on edge indicated readings of less than one-third of those placed parallel to the ground. All film badges were placed approximately 4 feet above the ground. This demonstrates conclusively that film badges left in active fall-out areas may indicate erroneous dose readings, since the contribution of beta emitters from the fission fragments lodged in the covering of the film badge contribute significantly to the emulsion's reduced amount of silver, thereby

giving a higher optical density. This may also have been one source of errors for personnel film badges that were worn within the test site, since winds and vehicles, etc., often stirred up a large amount of contaminated dust in the air which may have lodged in the pocket holding the film badge. In all instances monitors should be advised to keep a log of their meter readings at all times. An example of the use of such continuous readings is the case of the monitor located at Lincoln Mine during SNAPPER (Shot 5) (see Fig. 6.7). From these continuous readings taken by the monitor, it was possible to compute immediately the dose received in a populated area (Lincoln Mine, population 110) while the fall-out was in progress. This type of information was invaluable to the Director of the Rad-Safe Group and to the Test Director, who had to make the decision either to evacuate these persons or request them to remain indoors during the fall-out period.

TABLE 6.3

Mobile Monitors' Log - Shot 7, 1 June 1952 - Monitors: Pfc Charles O. Huffman and Pfc Donald Wilt

TIME	DOSAGE RATE	LOCATION
0600	.17 mr/hr	First Check Point on Yucca Flat
0605	.2 mr/hr	1 mi. N of CP
0607	.16 mr/hr	2 mi. N of CP
0608	.23 mr/hr	3 mi. N of CP
0609	.35 mr/hr	4 mi. N of CP
0610	.4 mr/hr	5 mi. N of CP
0612	.5 mr/hr	6 mi. N of CP
0613	.6 mr/hr	Road Junction to T-1 Area
0615	1.0 mr/hr	"Y" Road Junction
0618	1.3 mr/hr	1 mi. N of "Y"
0620	1.6 mr/hr	Road Junction to T-4 Area
0623	100. mr/hr	1 mi. N of T-4 Road
0624	50. mr/hr	2 mi. N of T-4 Road
0626	80. mr/hr	3 mi. N of T-4 Road
0630	15. mr/hr	Road Junction to T-2 Area
0634	1.4 mr/hr	At T-2
0653	1.8 mr/hr	1 mi. N of "Y"
0655	900. mr/hr	2 mi. N of "Y"
0658	1600. mr/hr	3 mi. N of "Y"
0700	11. R /hr	4 mi. N of "Y"
0704	15. R /hr	5 mi. N of "Y" at First-Aid Sta.
0707	10. R /hr	6 mi. N of "Y"
0710	9. R /hr	7 mi. N of "Y"
0712	7.5 R /hr	8 mi. N of "Y"
0714	3.6 R /hr	9 mi. N of "Y"
0717	800. mr/hr	10 mi. N of "Y"
0721	200. mr/hr	Groom Road Barricade
0726	60. mr/hr	12 mi. N of "Y"

TABLE 6.3 (Cont'd.)

TIME	DOSAGE RATE	LOCATION
0728	20. mr/hr	13 mi. N of "Y"
0732	12. mr/hr	15 mi. N of "Y"
0737	8. mr/hr	17 mi. N of "Y" at Water Tank
0740	6. mr/hr	19 mi. N of "Y"
0745	5. mr/hr	21 mi. N of "Y"
0750	4. mr/hr	23 mi. N of "Y"
0753	5. mr/hr	25 mi. N of "Y" on Groom Lake
0758	6. mr/hr	28 mi. N of "Y"
0801	4.5 mr/hr	30 mi. N of "Y"
0810	4.5 mr/hr	31 mi. N of "Y"

6.2.6 Radioactive Decay of Ground Contamination in Target Areas During TUMBLER-SNAPPER

The decay of radioactive contamination in the target areas was studied for each shot, using both the "area decay" and "point decay" methods. The area decay method consists of measuring the area bounded by a given isointensity line (10 mr, 100 mr, etc.) at successive time intervals on a plot of intensities made from the readings obtained from ground survey teams. This method was used to determine the "effective" half-life; that is, decay factors, for the four air shots of this Operation. Figure 6.8 is a decay factor graph of area in square feet versus time in hours after detonation, made from a composite of readings obtained from Shots 1, 2, 3, and 4. Figure 6.9 is a plot of decay factors versus time in hours for the decay of induced activities from air shots. Readings for the first four shots were continued twice daily for approximately 5 to 7 days, after which time the intensities were sufficiently low that they were no longer of concern for Rad-Safe purposes.

For the tower shots it was not possible to close the isointensity lines due to the extensive area of contamination, the rugged type of terrain, and the necessity for restricting the monitors' doses to a minimum so that they would be available for the remainder of the operation without exceeding the dose tolerance limit. However, a large number of readings were taken and analyzed and the results are plotted in Figure 6.10, "Composite Decay Curve for Tower Shots in TUMBLER-SNAPPER". Here again, for approximately the first seven days the "effective" halflife was approximately 13 hours, and thereafter, for approximately 60 days, an "effective" half-life of approximately 26 days was experimentally determined. At times greater than 60 days the induced activity will have decayed to insignificant levels as compared with the activity of the longer lived fission products, and therefore, the decay curve follows the $t^{-1.2}$ decay relationship.

6.2.7 Dosages Accumulated by Personnel Participating in the TUMBLER-SNAPPER Series 1 April through 9 June 1952

At the conclusion of this operation 27/2243 (1.1 per cent) of the test participants exceeded the 3.9 r maximum dose established for the TUMBLER-SNAPPER operation. The home organization of each of these individuals was notified by letter from the Director of the Rad-Safe Group. The individuals who exceeded the 3.0 (3) r accumulated gamma dose on their last entry into the contaminated area are listed in Table 6.4.

Table 6.5 presents doses accumulated by personnel participating in the TUMBLER-SNAPPER operation during the period 1 April through 9 June 1952. This table does not include troop participation, which operated from Camp Desert Rock.

TABLE 6.5

DOSAGES ACCUMULATED BY PERSONNEL - 1 APRIL THROUGH 9 JUNE 1952

ACCUMULATED DOSAGES (mr)	NUMBER OF PERSONS	ACCUMULATED DOSAGES (mr)	NUMBER OF PERSONS
0	492	2000 to 2100	23
1 to 100	673	2100 to 2200	13
100 to 200	248	2200 to 2300	16
200 to 300	124	2300 to 2400	14
300 to 400	62	2400 to 2500	11
400 to 500	64	2500 to 2600	11
500 to 600	45	2600 to 2700	7
600 to 700	25	2700 to 2800	5
700 to 800	34	2800 to 2900	6
800 to 900	32	2900 to 3000	5
900 to 1000	48	3000 to 3100	2
1000 to 1100	36	3100 to 3200	8
1100 to 1200	29	3200 to 3300	0
1200 to 1300	15	3300 to 3400	9
1300 to 1400	20	3400 to 3500	4
1400 to 1500	21	3500 to 3600	4
1500 to 1600	17	3600 to 3700	4
1600 to 1700	22	3700 to 3800	1
1700 to 1800	17	3800 to 3900	3
1800 to 1900	25	3900 to 4000	1
1900 to 2000	19	In excess of 4000	26
			2243

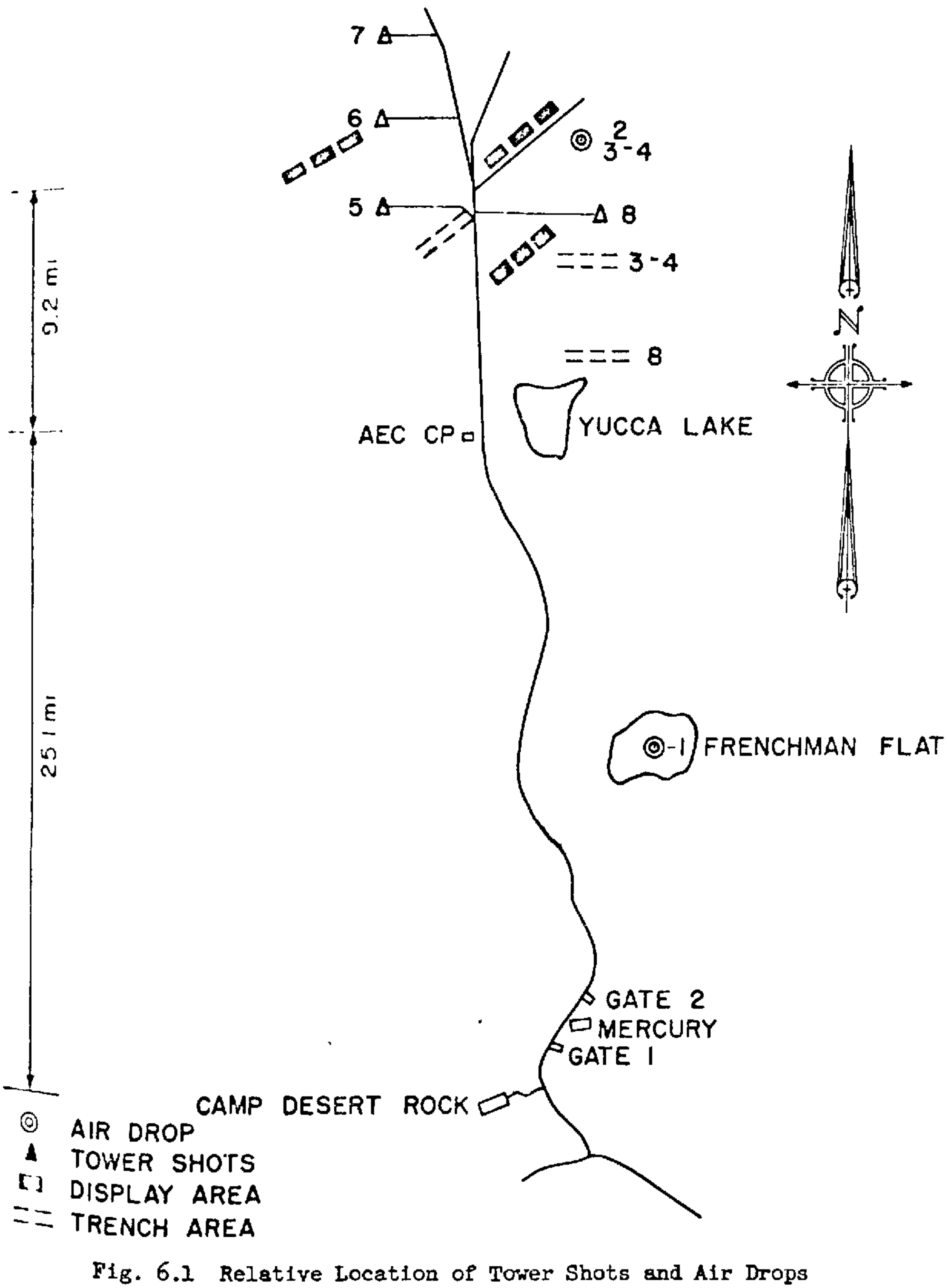


Fig. 6.1 Relative Location of Tower Shots and Air Drops

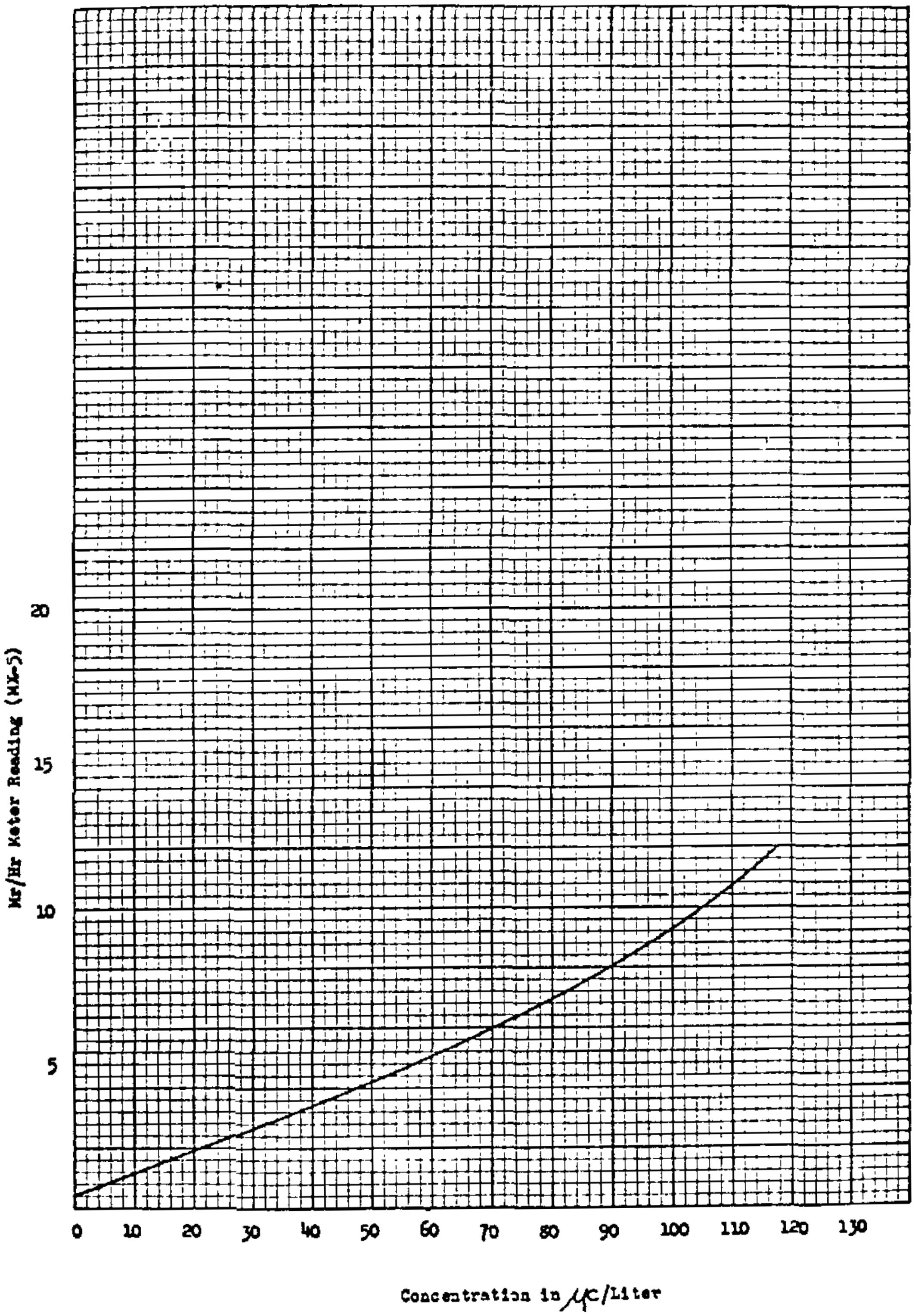


Fig. 6.2 Calibration Curve for Determining Specific Activities of Water Samples (MX-5 Readings vs Activity of H_2O).

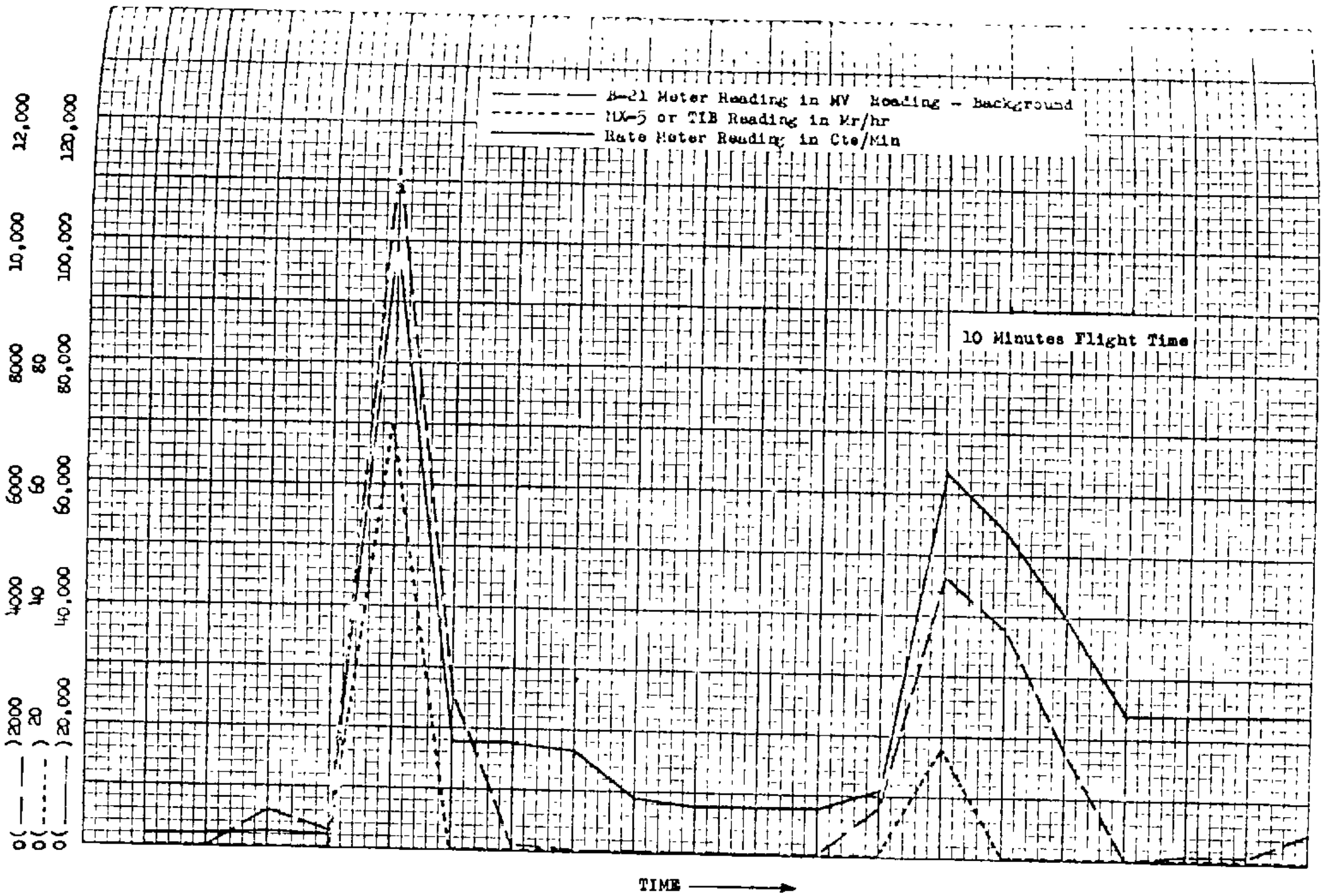


Fig. 6.3 Airborne Radiac Instrument Readings vs Time and Position Shot 7

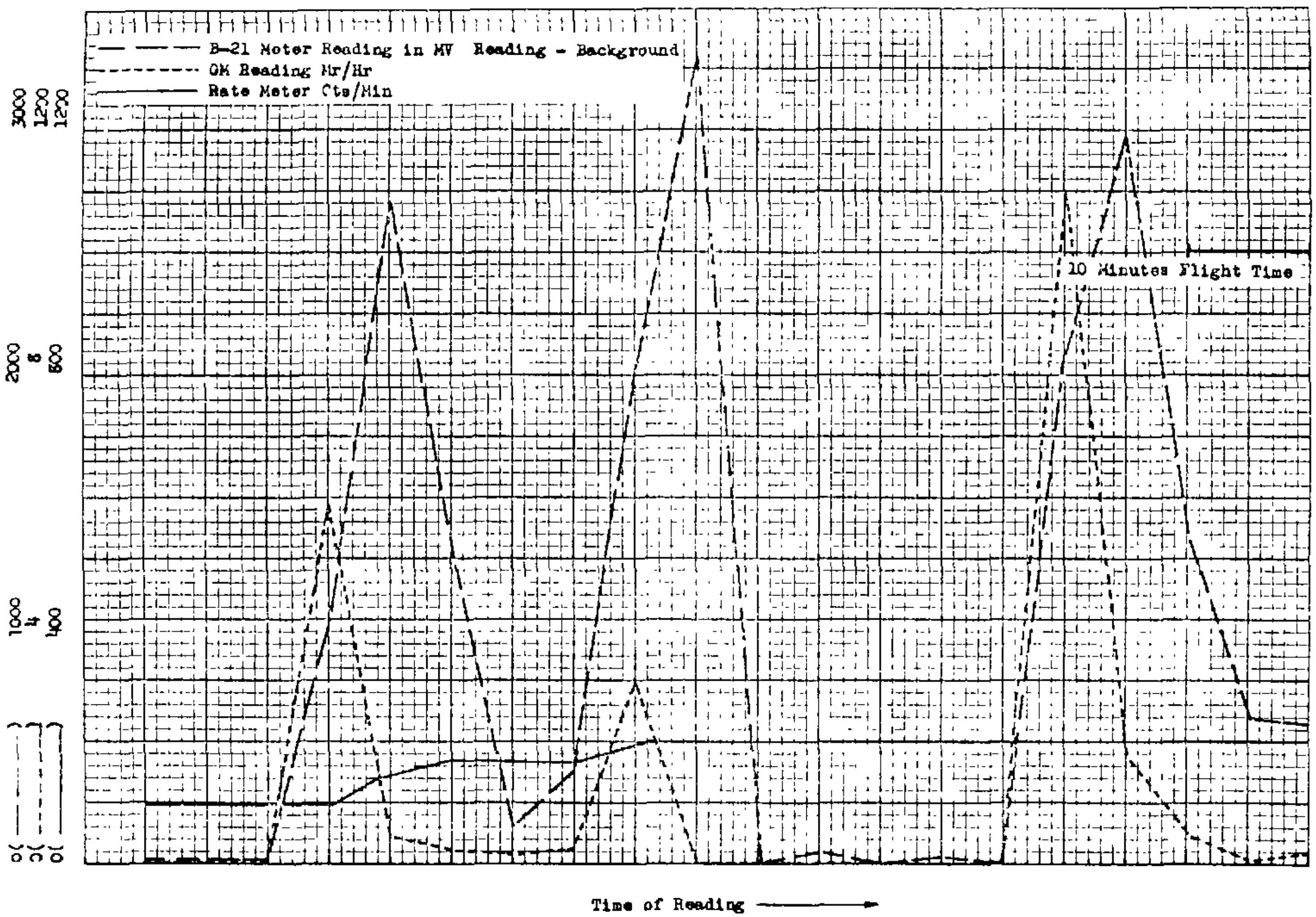


Fig. 6.4 Airborne Radiac Instrument Readings vs Time and Position Shot 8

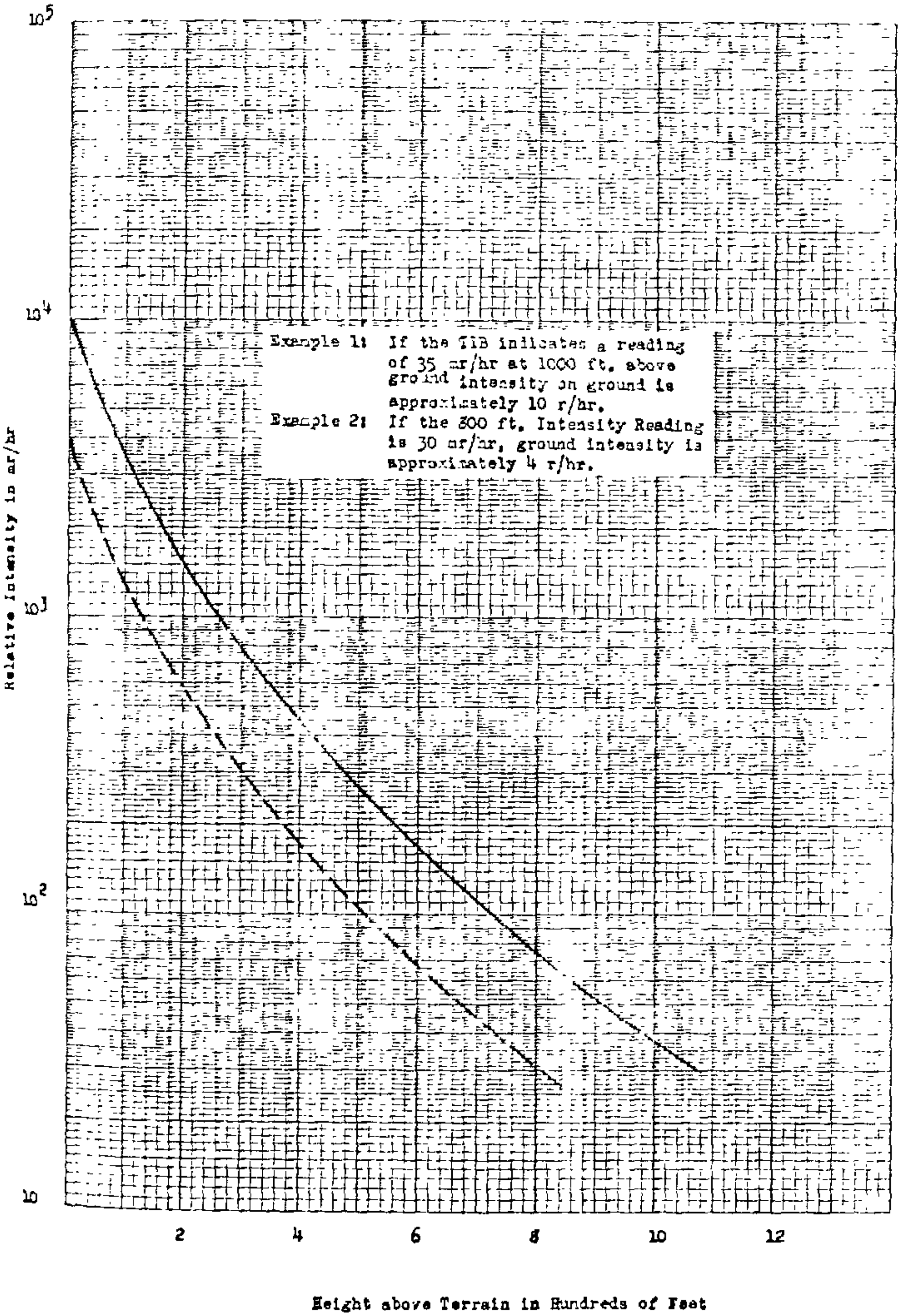


Fig. 6.5 Air to Ground Extrapolation Curves of Intensities

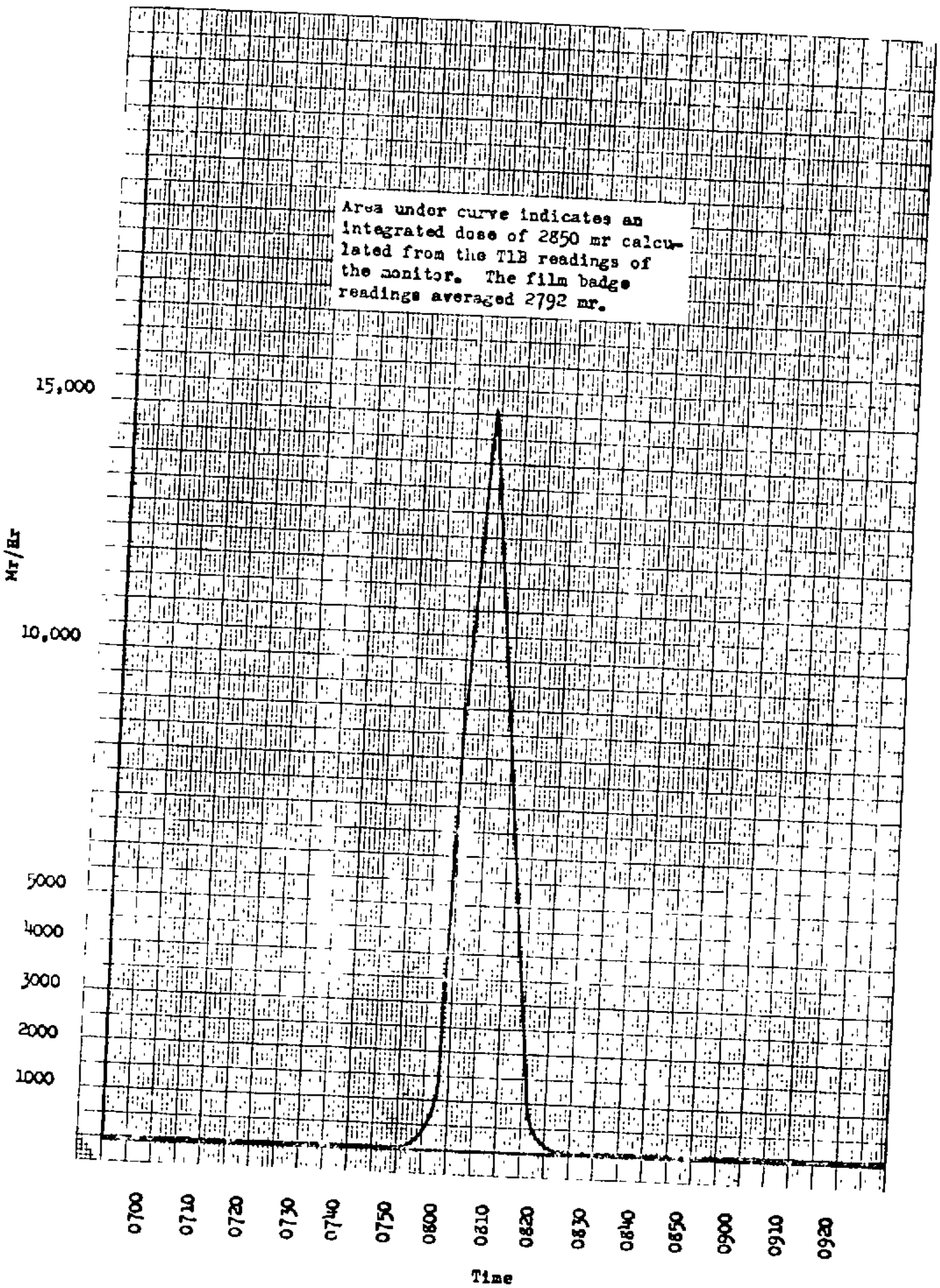


Fig. 6.6 Integrated Dose Curve Shot 5

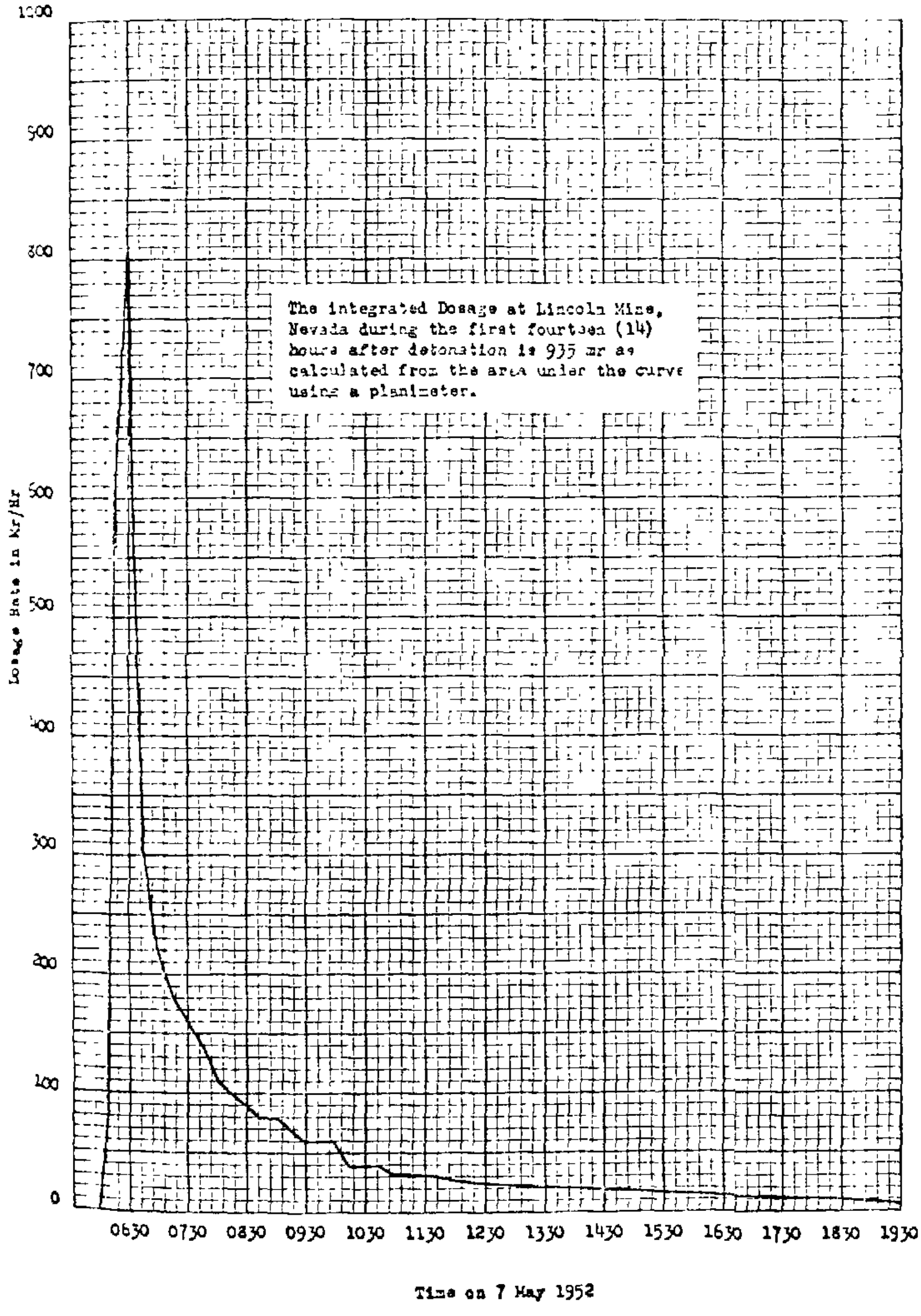


Fig. 6.7 Integrated Dose Curve - Lincoln Mine - Shot 5

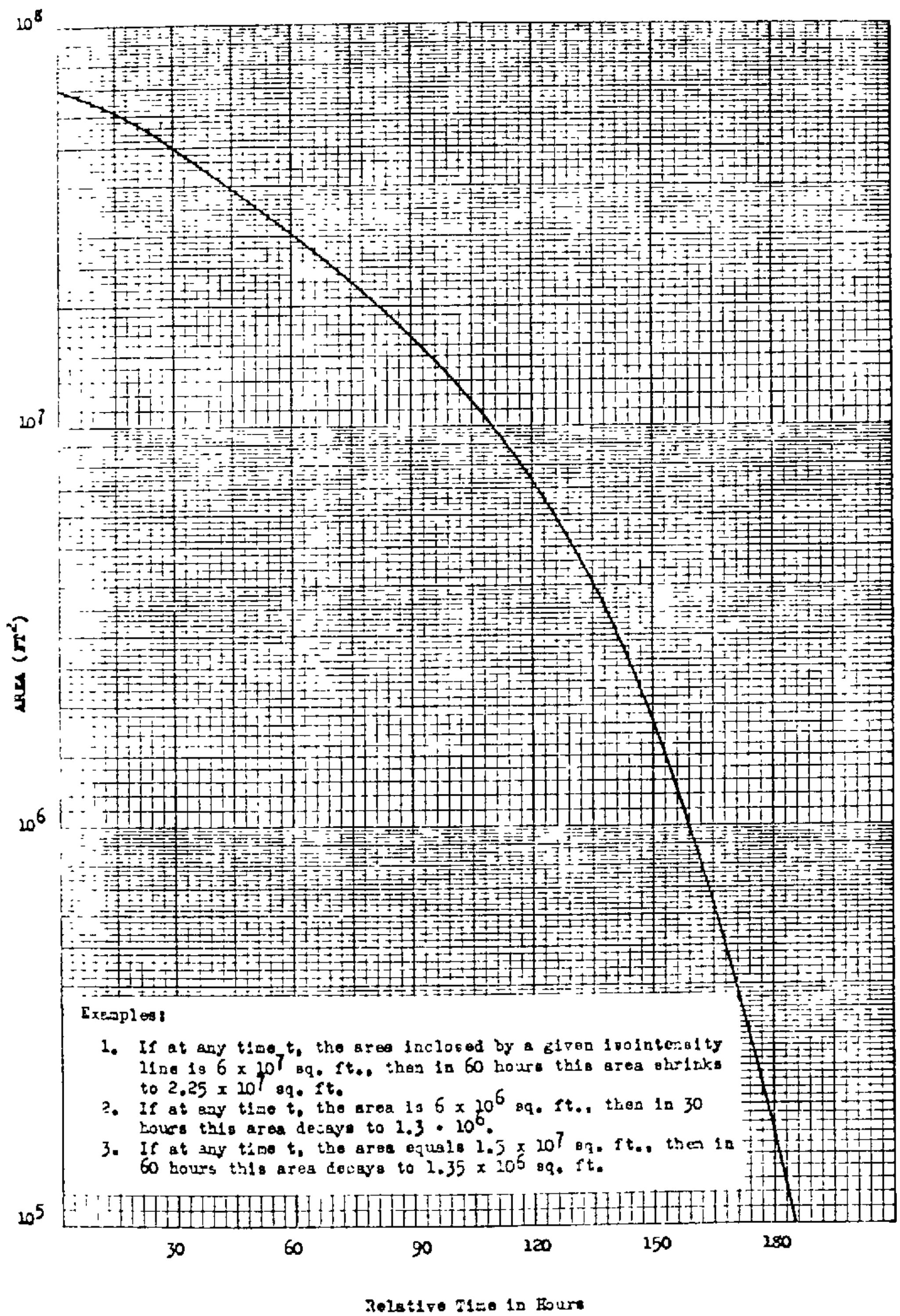


Fig. 6.8 Area Decay Curve for Air Shots

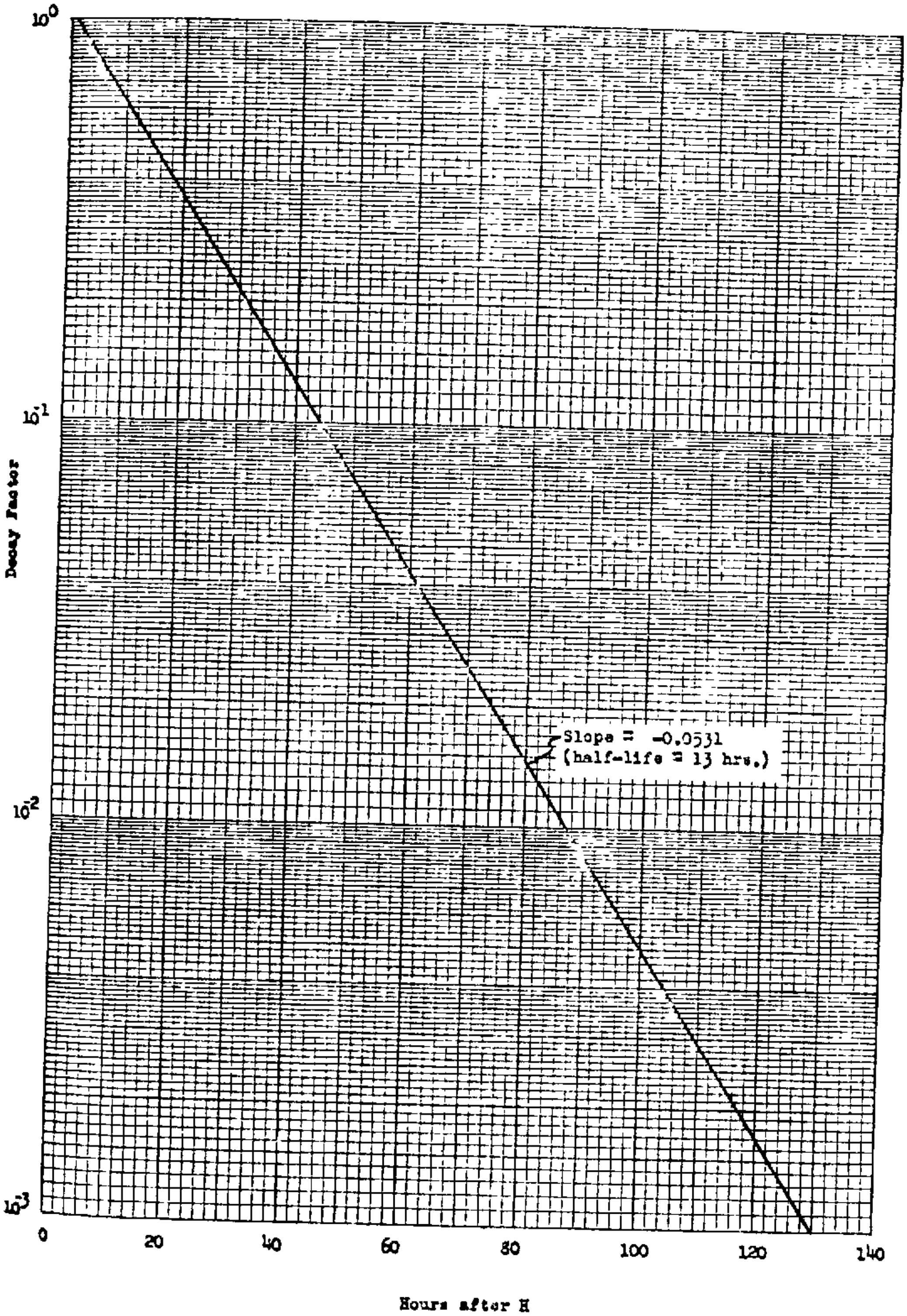


Fig. 6.9 Decay Curve for Air Bursts

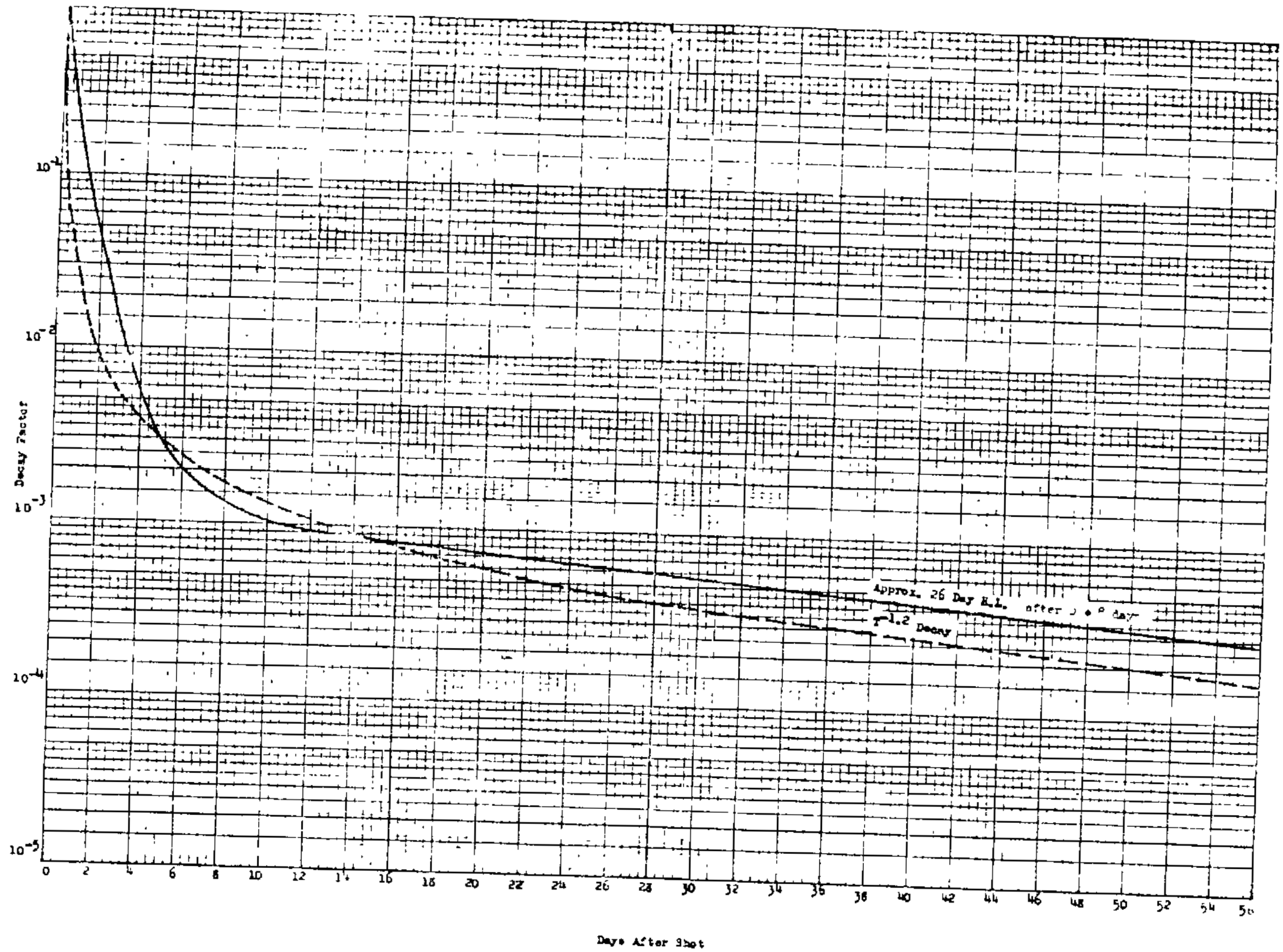


Fig. 6.10 Decay Curve for Tower Shots

CHAPTER 7

CONCLUSIONS AND RECOMMENDATIONS

7.1 DISTRIBUTION OF RAD-SAFE DIRECTIVES

Many of the technical test recovery personnel were not familiar with the Rad-Safe policies and directives issued by the Test Director in the Operation and Administrative Orders. It is therefore recommended that their distribution be made separately to all project leaders, so that they may be informed of the procedures to be followed.

7.2 REPLACEMENT ROTATION OF FIELD MONITORS

If future test operations are to be as extensive as Operation TUMBLER-SNAPPER, it is recommended that the field monitors re replaced as they approach the tolerance limit of 3 roentgens with new field monitors, who should report for duty approximately 10 days prior to the time they are to assume the duties of Rad-Safe monitors. During this 10-day period they could be given sufficient indoctrination training to qualify them for this job. This would tend to minimize the number of over-exposures, provide training for a larger number of individuals, and provide greater stability to the Rad-Safe Organization, since the supervisory program monitors and technical specialists would not have to be rotated from their primary jobs. It is also felt that once the scope of the test operation is known, a closer estimate of the number of field monitors required during any period can be made, so that, except for the 10-day exchange period, a smaller number would need to be present at any one time.

7.3 SEQUENCE OF FIRING TOWER SHOTS

The order of firing the tower shots was such that the area scheduled for the next shot was contaminated to such an extent that work in the area was delayed. It is recommended that if possible all tower shots be fired in an up-wind sequence to prevent recurrence of the above. In future operations, where both air and tower shots are to be fired, it is suggested that one tower area be readied and kept on stand-by to take advantage of the first satisfactory weather conditions. Since weather conditions are critical for tower shots and not for air shots, this procedure may reduce the number of days delay necessary to obtain satisfactory winds and thus result in a considerable saving of money.

7.4 ROAD NET FOR TARGET AREAS

On-site survey teams encountered many difficulties reading stake positions on the eight radial stake lines to measure radioactive intensities. This situation resulted in excessive wear and tear on the vehicles and, in some cases, made it impossible to take readings at

many positions. Inaccessibility was due to both the roughness of the terrain and the high intensities encountered. To facilitate the work of survey teams, it is recommended that roads be constructed along each radial stake line in each target area out to a distance of 3500 yards, with connecting circular roads at 300 and 700 yards from ground zero. These roads should permit the passage of four-wheel drive vehicles (jeeps and weapons carriers) and be approximately 10 feet wide. This recommendation is made for the following reasons:

(1) To permit accomplishment of Rad-Safe surveys expeditiously.

(2) To reduce the wear and tear on vehicles, thereby reducing maintenance and repair costs.

(3) To reduce the wear and tear on radio equipment and monitoring instruments.

(4) To reduce the exposures received by Rad-Safe monitors and other personnel who may utilize these roads in their work.

(5) To prevent the possibility of damaging vehicles due to the ignition of brush trapped under vehicles. (This recommendation was made in a memorandum to the Test Director 6 June 1952. It is understood that it has been approved and that the roads will be constructed prior to the next test series.)

7.5 VEHICLE AND DECONTAMINATION SECTION. (Submitted by Officer in Charge of this Section, David C. Durrill.)

(1) Early in this operation it was found that the "hot" drainage sump from the Rad-Safe Building and the Vehicle Decontamination Station was inadequate. Therefore, an open soakage pit was constructed south of the Vehicle Decontamination Station. However, contaminated dust and spray blowing toward the Rad-Safe area from this open pit caused a radiation hazard to exist. It is recommended that this problem be investigated to determine the best practical type of closed disposal system. It may be possible that an efficient disposal plant can be constructed, not only to eliminate the radiological hazard but also to reduce the amount of water consumed by passing the water through a succession of filtering traps followed by mechanical filtering. This water could then be passed through one or more flocculation chambers with a settling basin and filtered. It is the concensus of opinion that, if the resulting purified water contained less than 100 counts per milliliter, it could be recycled through the decontamination system without danger to operating personnel. This disposal system should be designed to have a maximum operating capacity of 10,000 gallons per day, as this figure represents the maximum water consumption during the heaviest operations of TUMBLER-SNAPPER.

(2) Room No. 1 of Vehicle Decontamination Station Building contains insufficient space for desk, table, bunks, etc. If possible, another room should be added on one side to provide space for two bunks and lockers for personal clothing.

(3) The floor in Room No. 4 containing the steam generator should be pitched toward the drain, and the floor space underneath the generator furnace should be open on two sides to provide drainage after washing down the furnace coils. This generator will require considerable maintenance prior to extensive use during the next operation.

(4) A high pressure hot water and detergent injector is needed. The unit should be capable of providing water at 180° F at a rate of 1000 gallons per hour with 60 pounds per square inch pressure.

(5) A second steel ramp should be built similar to the one existing, but with no flange at the "breaks". The tracks should not be more than 3'4" apart, so that jeeps could be handled. The total outside width should be at least $7\frac{1}{2}$ feet, and the slope of the ramp entrance should be not greater than 15 percent with the height of the ramp at 5 feet. This additional ramp would increase the number of vehicles per day that could be decontaminated.

(6) The existing concrete slab should be extended further into the working area. At least 30 feet of this extension should have one-half percent slope to the existing slab, and another 50 feet should be flat. This improvement is of vital necessity, as the present surface of asphalt is too soft and rough to permit removal of contamination. During the heavy work periods high background readings were encountered, so that it was often necessary to remove the vehicle to a clean area to determine if the vehicle was below the tolerance limits. A second concrete slab is needed south of the present working area to permit easier control of background contamination caused by splashing of contaminated spray from vehicles on the ramp area. The present dirt surface is extremely difficult to keep at a low background level.

(7) Other conclusions and recommendations, for both expendable and non-expendable equipment and supplies, were included in the report of operations by the Vehicle Decontamination Section in the letter "Subject: Recommendations for Materiel Procurement and Improvement of Existing Facilities for the Vehicular Decontamination Station" to the Director of Materiel, Rad-Safe Group, 10 June 1952, by Mr. Durill, a copy of which was submitted to Mr. Charles Leverton, J-6 of the Test Director's organization.

7.6 GASOLINE FACILITIES AT THE CP

It is recommended that gasoline facilities at the CP be augmented by installing additional gasoline storage tanks so that it will not be necessary for vehicles to return to Mercury solely for the purpose of obtaining gasoline.

7.7 CHANGE OF LOCATION OF DECONTAMINATION LAUNDRY

During the TUMBLER-SNAPPER operation the Decontamination Laundry Unit was located at Indian Springs. This necessitated hauling clothing back and forth between the CP and Indian Springs several times a week. It is recommended that adequate equipment be installed in the Rad-Safe Building to accomplish this work. A laundry room is already available in the Rad-Safe Building, but lacks the necessary equipment. The installation of this equipment would insure a considerable saving in the manpower and money involved in handling and transporting as well as reduce the quantity of protective clothing needed on hand to meet peak load conditions.

7.8 ADDITIONAL SPACE FOR DOSIMETRY AND LABORATORY RECORDS SECTION

It is recommended that a part of the present conference room in the Rad-Safe Building be partitioned off to provide office space for Dosimetry and Laboratory Records Section. Existing facilites were too small and a temporary partition was constructed to provide office space to maintain records. The maintenance of these records is essential, but this cannot be accomplished adequately without additional space.

7.9 PERMANENT ELECTRICAL WIRING SYSTEM FOR INSTRUMENT REPAIR SHOP

With continued usage, the temporary electrical system installed in the Radiac Instrument Repair Shop in the basement of the Rad-Safe Building may become an electrical hazard. It is therefore recommended that prior to the beginning of the next test series permanent type electrical wiring be installed for this section.

7.10 MICROPHONE FOR PA SYSTEM IN RAD-SAFE BUILDING

Shortly after each shot is detonated there is an abnormal amount of confusion in the Rad-Safe Building and surrounding area due to the large number of recovery parties who are scheduled to enter the contaminated areas at R-time. It is recommended that a remote microphone control for the Rad-Safe Building public address system be installed in the Plotting and Briefing Room. Then the officer in charge of the Plotting and Briefing Room could use the public address system to contact party leaders and their assigned monitors for briefing on the radiological situation prior to their departing the Rad-Safe Building.

7.11 RADIO COMMUNICATIONS

While the radio communications system used during the TUMBLER-SNAPPER operation was satisfactory for on-site work, it was not satisfactory for off-site purposes. The problem of obtaining adequate radio communications was constantly encountered during this test series. Numerous temporary expedients were tried, none proved entirely satisfactory. It is recommended that the system be investigated to determine the best obtainable system before the beginning of a future operation. The Rad-Safe communications requirements for direct vehicle-to-vehicle and vehicle-to-CP communications out to a radius of approximately 200 miles from the CP were outlined in a letter to the AEC Communications Department. Shortly after the beginning of the roll-up phase of this operation the AEC Communications Department began to investigate the possibilities for improving the radio communications system for off-site Rad-Safe operations. The preliminary results from a temporary repeater station (similar to the Charleston Peak Station) installed on the mountain west of the CP were very good. Various other methods are to be investigated. The use of portable, hand-carried transceivers in the past has not proved practicable, principally due to their low power output and the distance between the test area and the repeater station located on Charleston Peak, through which they must operate to reach the CP. With a permanent repeater station located on the mountain just west of the CP, the transmission distance would be reduced to approximately 10 to 15 miles, as compared with the 65 miles to the Charleston Peak repeater station. The range of these transceivers is sufficient to cover the 10 to 15 miles satisfactorily. It is recommended that the 20 transceivers which are on hand at the Nevada Proving Grounds be placed in operational order and tested prior to the next operation to augment Rad-Safe radio communications.

7.12 FILM BADGES

The Dupont #558 film used during the TUMBLER-SNAPPER operation (see Par. 6.2.5) was inclosed in a soft plastic covering. It was found that fine particles of radioactive dust adhered to this covering and that the gamma rays and beta particles emitted by this dust contributed to the indicated film badge dose. This film badge was designed to be worn in the individual's pocket. Often "hot" dust stirred up by winds or vehicles lodged in the pocket and contaminated the film badge cover. This was also true for the off-site monitors who were in active areas of radioactive fall-out. It is thought that this could be prevented if the film were inclosed in a hard plastic cover with a metal grommet so that it may be worn on the outside. The various film manufacturers have been contacted by Lt Colonel Paul Day, AFSWP, concerning this problem.

7.13 BOOTEES

It was necessary to use masking tape around the bootees and the bottoms of trousers to prevent contamination from lodging in the bootees and contaminating the shoes. It is recommended that a bootee be manufactured with an adjustable cloth strap that can be wrapped around the bottom of the trousers and thus eliminate the need for the masking tape. In addition to saving the expense of the masking tape, this design would make it easier to put the bootees on and save the man hours expended in removing the masking tape from the protective clothing and bootees prior to sending them to the Decontamination Laundry.

7.14 RELATIVE IMPORTANCE OF OFF-SITE OPERATIONS FOR AIR SHOTS AS COMPARED TO TOWER SHOTS

Since there is no appreciable fall-out in off-site areas from air shots, it is recommended that the Rad-Safe off-site operations be held to a minimum, consistent with the determination of the fall-out pattern, cloud trajectory, and the intensities of populated areas. However, for all tower, surface and underground shots, in which the radioactive fall-out may be of sufficient magnitude to be a radiological hazard, it is strongly recommended that the off-site operations be given high priority.

7.15 RATED FLYING PERSONNEL FOR RAD-SAFE AIR OPERATIONS

In Rad-Safe aerial operations (cloud tracking, terrain survey, etc.) monitors must be rated pilot officers, since they function as aircraft commanders in directing the flight patterns of their aircraft. The Department of the Air Force requires by regulation that only rated pilots may exercise command of aircraft. Also, since rated personnel are less apt to become airsick in the often turbulent air in Nevada, it would be desirable to have these individuals perform the aerial part of off-site operations.

7.16 RADIO ALTIMETERS FOR SURVEY AIRCRAFT

In order to provide the absolute altitude above terrain, which is necessary for converting intensities measured in the air to the intensities on the ground, it is recommended that the L-20 and C-47 aircraft be equipped with radio altimeters. The standard type of aircraft altimeter is not suitable for this purpose.

7.17 CONSOLIDATION OF RAD-SAFE OFFICES IN ONE LOCATION

It is recommended that the Rad-Safe offices in Building No. 1 at the CP be consolidated on one floor, with the Rad-Safe Information and Operations Center in the middle, and the Off-Site Operations Offices and

the Rad-Safe Director's Office located on either side. This would require approximately 900 square feet of floor space. The present space for the Off-Site Operations Department is too small for the radio operators and plotters to operate independently and apart from the distrubances created by visitors. One side of the Rad-Safe Information Center should be inclosed with glass so that spectators could see Rad-Safe information conspicuously posted on large map boards on the walls, without entering the room. This would serve to reduce the noise level and therby permit more efficient operations.

7.18 VEHICLES FOR OFF-SITE OPERATIONS

It is recommended that sedans and pickup trucks be used for off-site transportation. The carryalls used as a substitute for sedans were costly to maintain and generally undesirable.

7.19 RECOMMENDED NUMBER OF PERMANENTLY ASSIGNED RAD-SAFE PERSONNEL

The number of permanently assigned personnel necessary to provide continuity of the Rad-Safe Group from one operational period to the next, based on the assumption of two test series per year, is shown below. If there is to be only one test operation per year, it is recommended that this number of persons remain the same, except the number of radiological safety engineers could be reduced to one.

3 radiological safety engineers
1 Rad-Safe supply officer
2 Rad-Safe supply enlisted men
2 radiac instrument repairmen
1 photographic dosimetry specialist
1 counting lab technician

This should provide an adequate nucleus which can be augmented prior to the beginning of test operations with additional Rad-Safe engineers, monitors, clerks, etc., as necessary to meet Rad-Safe requirements during the test series. Since the Rad-Safe Unit provides radiological safety services during the interim period between test operations for area clean-up and construction crews, technical recovery crews, etc., working in contaminated areas, the recommended personnel will have a year-around function to perform. The number of field monitors required for the interim period should be varied to meet the situation. For example, during the months of March and April, 1952, the Rad-Safe Unit provided services for Operation BUSTER-JANGLE personnel ranging in number from 8 to 122 per day, and at the conclusion of the operational period of TUMBLER-SNAPPER the number of personnel entering contaminated areas ranged from approximately 3 or 4 to 30 per day.

7.20 MOBILE AIR SAMPLING AND FALL-OUT STATIONS

During this operation 18 fixed air sampling and fall-out stations were employed. Only negative data were obtained from any of these stations except those (four or five) in the fall-out pattern. Later in the operation two mobile air sampling and fall-out stations mounted on $\frac{1}{2}$-ton pickups were employed. It was found that these stations could be moved into the fall-out area in sufficient time to obtain results. As will be noted from the data and computations, the internal hazard is negligible in comparison with the external hazard. It is therefore recommended that air sampling stations for Rad-Safe purposes be discontinued. This would enable the Off-Site Monitoring Department to measure the external hazard more often and over a wider area.

7.21 AERIAL TERRAIN SURVEYING

Since it has been found possible to relate air intensities at various heights to ground intensities, it is throught that more extensive use should be made of the two C-47 and two L-20 aircraft (equipped with radio altimeters) in delineating the off-site areas of contamination and the actual surveying of the intensity levels. Aerial terrain surveying gives more information in areas inaccessible to vehicles, and is able to cover a much larger area in a shorter time. The recommended procedure for this is to use one C-47 to delineate the contaminated area, and after one to two hours, when the fall-out has occurred, have the L-20's and the second C-47 fly at specific heights over the contaminated area in a normal grid pattern to accomplish the survey. Any areas of sufficiently high intensities could then be checked by the off-site ground mobile monitors. Using this procedure, the number of ground mobile monitoring teams could be reduced to approximately five without sacrificing any necessary data.

CHAPTER 8

RAD-SAFE GROUP ROLL-UP PHASE

8.1 ROLL-UP

Around 15 May the Rad-Safe Group made initial plans for the "roll-up" of the TUMBLER-SNAPPER Operation. The roll-up for the Rad-Safe Group actually began several days after the last shot (5 June). All equipment and materiel was inventoried by the Department of Logistics and Materiel with the assistance of the other Departments, and that which was not needed for the interim operational period was prepared for storage. The officers in charge of the various departments and sections began to assemble and prepare the data and operational history pertaining to their respective sections. A small Rad-Safe Unit, consisting of three officers and approximately 25 enlisted men, was organized to handle the Rad-Safe requirements for the interim period between test operations. This Unit was capable of providing all of the fundamental Rad-Safe services, but on a smaller scale, that were provided during the TUMBLER-SNAPPER Operation. After the last shot, when it had been decided to accomplish the clean-up of the contamination from the tower areas at a later date, the above number of personnel was reduced by approximately one-half. However, plans were made so that at such time as it is decided to begin the decontamination and clean-up of the tower areas, the current standby personnel of the Rad-Safe Unit will be augmented with additional monitors as required. All of the tower areas were surveyed daily in the period of 5 June to 30 June to obtain data from which the decay studies of the residual contamination could be completed (see Par. 6.2.6). Within several days after the last shot, the majority of the test recovery personnel had departed NPG and only a few crews remained to recover test equipment and materiel from contaminated areas. By 15 June, 10 days after the last shot, there were three or four recovery parties or persons per day working in contaminated areas.

APPENDIX A

OPERATION TUMBLER-SNAPPER
Shot 1 - 1 April 1952
(Period Covered: 1 April - 14 April 1952)

OPERATIONAL DATA

Location: Frenchman Flat
Height of Burst: 793 ft. SRd
Yield (KT): 1.05 - 1.07
Time Fired: 0900 (PST)

OPERATION TUMBLER - SNAPPER
Shot 1 - 1 April 1952

A.1 OFF-SITE OPERATIONS DEPARTMENT

On 1 April at 0900, A [redacted] weapon was detonated in Frenchman Flat. In preparation for this first scheduled nuclear explosion, a dry-run was held on 30 March in which a high explosive bomb was dropped from an aircraft and detonated in the air above the general vicinity of the proposed ground zero in Frenchman Flat. The Off-Site Operations Department did not participate to any great extent in the dry-run since the radio communications check had been accomplished prior to the dry-run day, and since the C-47 air relay equipment installations had not been completed at this time. All instruments (T1b's and MX-5's) were calibrated and the personnel briefed on their assigned duties.

For the first nuclear shot, starting at approximately H-15 hours, the fall-out plots and cloud trajectories were calculated based on the estimated yield, altitude of burst, particle size distribution, and the forecast weather (wind velocities at various altitudes). These plots were changed or recomputed as new wind data became available. These wind data (pibal readings, rawin, radiosonde, etc.) were obtained from the Air Weather Service (see Table A.5). Approximately 5 or 6 hours prior to shot time the ground mobile teams were given final instructions and dispatched to positions indicated by the fall-out plot. The aerial monitors were given final instructions at approximately H-1 hour. The cloud tracking aircraft departed Inidan Springs Air Force Base at approximately H+15 minutes, while the aerial terrain survey aircraft (C-47 and L-20) departed at various times as directed by the Off-Site Operations Officer. No significant intensities were measured in off-site areas for this shot.

Data obtained by the Off-Site Operations Department are presented in Tables A.1 thru A.5 and Figures A.1 thru A.5.

A.2 MATERIEL AND LOGISTICS DEPARTMENT

By the time Shot 1 was fired the personnel in the Materiel and Logistics Department were well-briefed on the problems that could be expected, the specific duties they were to perform, and the standing operating procedures to be followed. The issuance of protective clothing was made with little or no confusion. Adequate supplies of protective clothing and instruments were on hand to meet all requirements. For this shot, 603 sets of protective clothing, 160 T1B's, 88 MX-5's and 691 film badges were issued. The communications system worked very well for on-site operations; however, difficulties were encountered by the off-site mobile monitors in contacting the CP. The C-47 air relay aircraft was unable to receive or transmit to the CP

in many instances. While the nature (low yield and height of burst) of the first shot did not necessitate surveys by mobile monitors at any great distances from the Nevada Proving Grounds, it was realized that the communications system was inadequate for off-site work. This problem was immediately brought to the attention of the AEC Communications Section.

A.3 ON-SITE OPERATIONS DEPARTMENT

Since no radiological hazard existed, the dry-run was utilized by Rad-Safe on-site personnel to check out their operating procedures and radio communications. For the first nuclear shot it was originally planned to utilize eight radial lines of serially numbered stakes spaced 100 yards apart, centered on target zero and oriented toward the eight principal points of the compass. Since the stakes were not received before the first shot, the only known distances from ground zero were the test data collecting stations located along the blast line parallel to the main access road. Consequently, accurate locations of residual radiological contamination intensity readings were made along this line by the initial post-shot and daily survey teams. Tabulations of these readings for Shot 1 on D-day, D+1, D+2, and D+3 days are attached. (See Table A.6.) The locations of isointensity points along the 10 mr/hr and 100 mr/hr lines, other than the blast line, were taken by monitors working in the field with scheduled test recovery parties, and their reports were consolidated with the initial post-shot and morning area survey teams' reports to plot the isointensity lines. Figure A.6 is the base map of the target area in Frenchman Flat, for which overlays (Figures A.7 through A.7.3) were prepared. A plot of intensity versus distance in feet from ground zero is shown as Figure A.8, which is an average of the readings in all directions from the actual ground zero. The Test Director's Operation Order 1-52, Annex A, scheduled 14 programs and 53 projects for participation in technical test activities. Program and project monitors, who were assigned approximately four days in advance, coordinated the Rad-Safe requirements of the participating projects. In addition to the regular scheduled recovery teams listed above, the On-Site Operations Department furnished 32 monitors on Shot Day, and 15 monitors on D+1 Day to accompany technical and work parties into the target area after the shot. These additions to the Schedule of Events caused some confusion, but since the levels of contamination in the target area after the detonation were relatively low, no undue hardship was imposed on the Rad-Safe Organization in supplying the additional monitors. At the same time, the Rad-Safe Group benefited from the larger number of monitors who gained practical field experience. Accumulated doses are presented in Figure A.9.

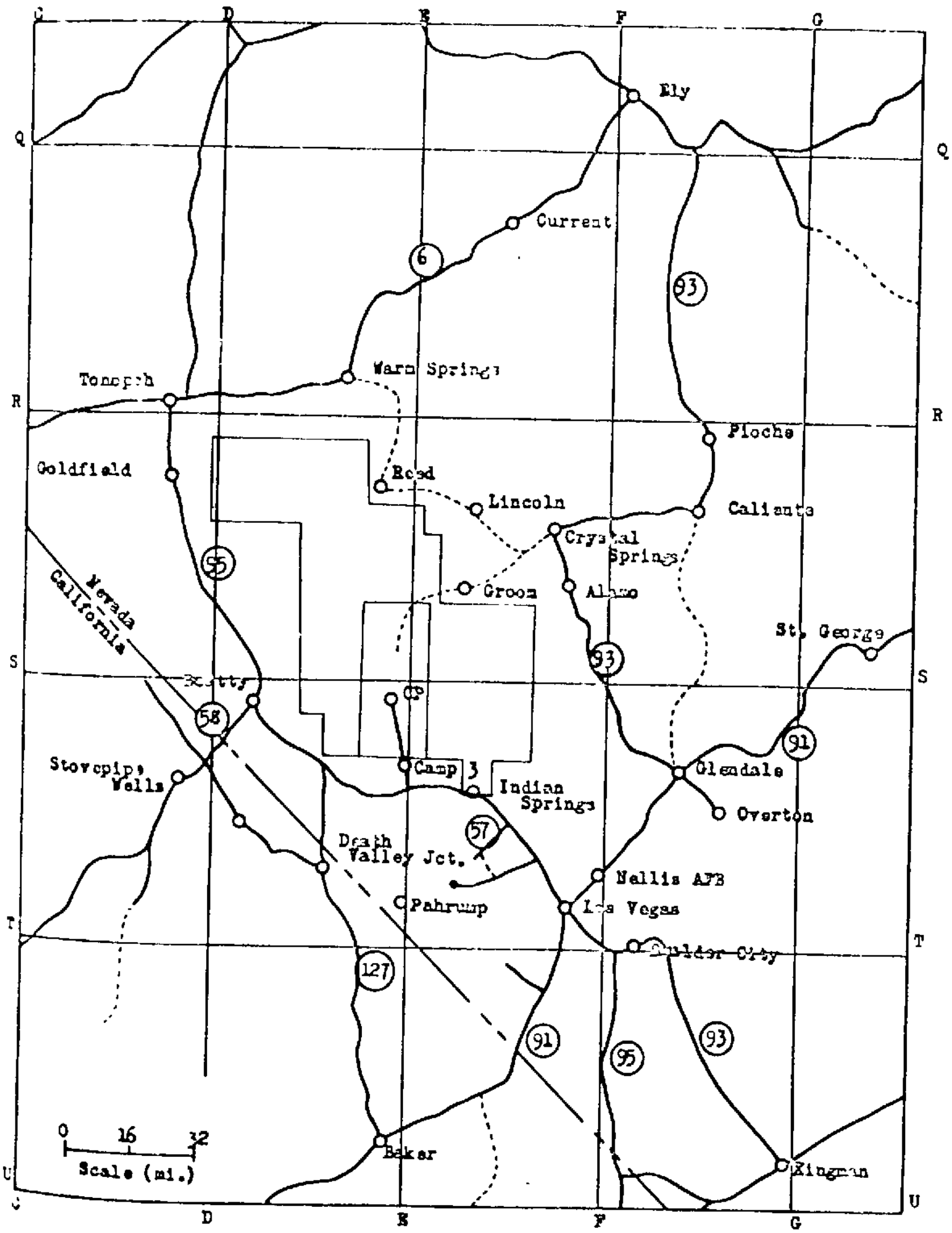


Fig. A.1 Grid Map for Ground Mobile Monitors' Reports Shot 1
(To be used in conjunction with Tables A.1, B.1, C.1 and D.1)

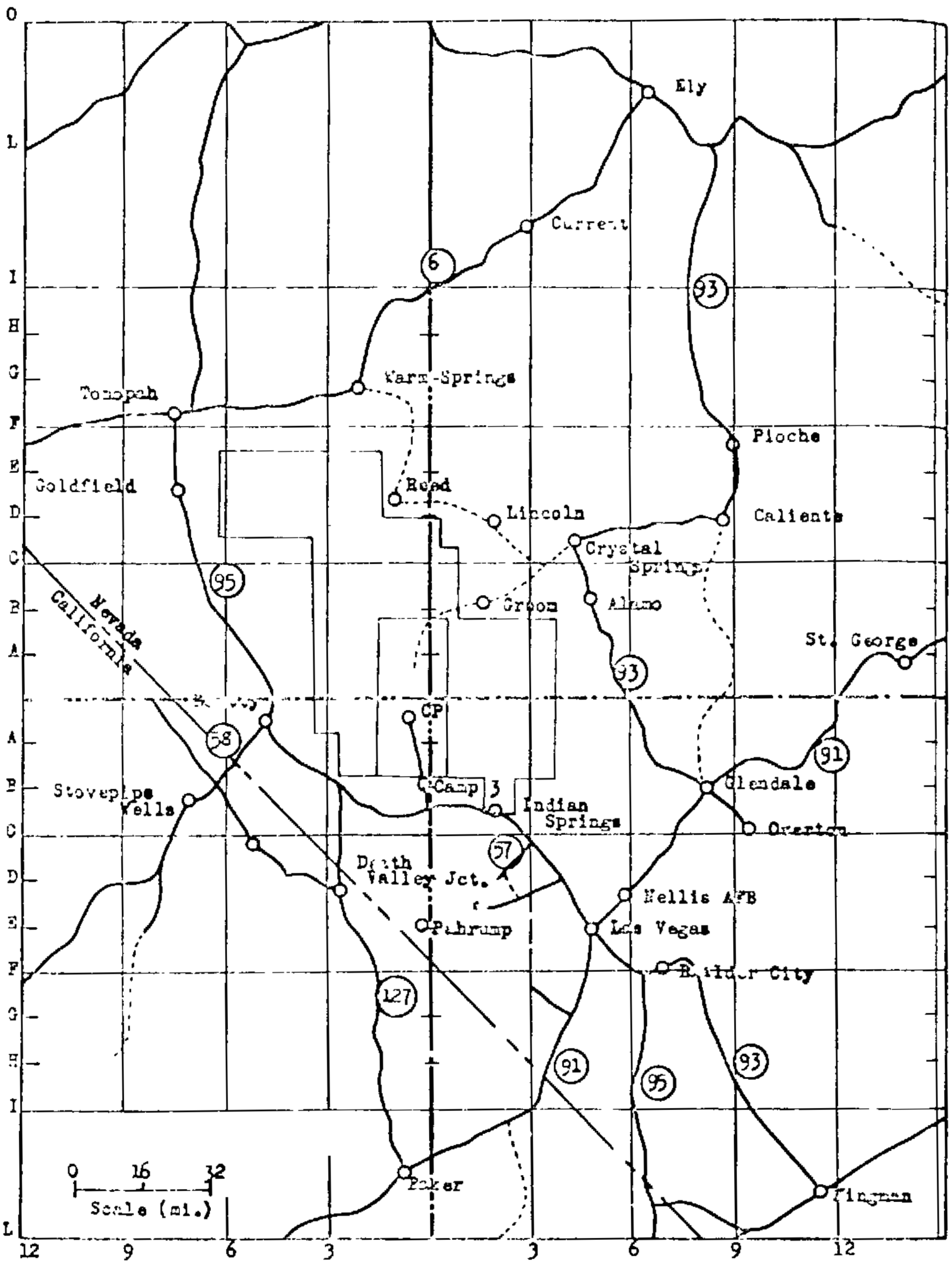


Fig. A.2 Grid Map for Aerial Surveys (To be used in conjunction with Tables A.2, A.3, B.2, B.3, C.2, C.3, D.2, D.3, E.2, E.3, F.2, F.3, G.2, G.3, H.2 and H.3.)

TABLE A.1

Ground Mobile Monitors' Report - Shot 1 - 1 April 1952. (See Fig. A.1). (Normal background: .02 - .04 mr/hr)

TIME	READING Mr/Hr	GRID LOCATION (Ref. Fig. A.1)	LOCATION IN DETAIL
0810	.02	F2 T2	Glendale Junct.
0933	.02	E4 T4	10 mi. N. of US 95 on Unmarked Rd. to Alamo
1215	.02	E1 T3	Indian Springs.
1230	.02	TO T2	37 mi. NW of Glendale Jct. on US 93
1300	.02	E5 S1	60 mi. NW of Glendale Jct. on US 93
1322	.02	E1 T3	Indian Springs
1325	.02-.1	E5 S1	15 mi. N. of US 95 on Unmarked Rd. to Alamo
1330	.02	E4 S3	20 mi. N. of Alamo on US 93
1332	.02-.05	E5 S1	25 mi. N. of US 95 on Unmarked Rd. to Alamo
1355	.02	E4 T2	Jct. US 95/Nev 39
1400	.02	E5 S3	43 mi. NE of Alamo on US 93
1410	.02	E4 T4	5 mi. N. of US 95 on Unmarked Rd. to Alamo
1415	.05	E5 S3	45 mi. W. of Caliente on US 93
1420	.02	D3 T4	Lathrop Wells
1445	.1	E4 S3	20 mi. N. of Alamo on US 93
1450	.02	E4 S2.5	Indian Springs
1500	.06	FO S3	40 mi. W. of Caliente on US 93
1515	.06	FO S3	40 mi. W. of Caliente on US 93
1530	.02	F2 S3	Caliente, Nev.
1600	.02	F1 S3	20 mi. W. of Caliente on US 93
1630	.05	E5 S3	40 mi. W. of Caliente on US 93
1700	.03	E2 S2	10 mi. N. of Alamo on US 93
1730	.02	E5 S1	20 mi. S. of Alamo on US 93

TABLE A.2

Aerial Terrain Survey Report (Badger I & 2). Shot 1 - 1 April 1952. (See Fig. A.2).
(Code: Badger - C-47 aircraft.)

Report Number	Grid Position (Ref. Fig. A.2)	Time of Report (PST)	Mean Sea Level Altitude (Ft.)	B-21 Meter Reading (Millivolts B.G./B.G. Cont.)	Rate Meter Reading (Counts/Min)	Geiger Mueller Reading (Mr/Hr)
Badger I						
1	2C2	1135	5000	55/55	25	.02
2	2C1	1140	4500	55/55	30	0
3	2C0	1145	5500	40/40	30	.02
4	2B0	1150	4500	47/57	40	.01
5	2A0.03	1155	4500	50/950	52-62	--
6	000.05	1200	5500	60/140	40	.03
7	1A1	1215	5500	60/300		3.5
8	1B1	1210	6500	300/700	3200	1.5
9	1B1	1215	4500	500/3200	Contam.	1
10	001	1220	6000	450/550	Contam.	.2
11	2A1	1225	5500	400/900	Contam.	.3
12	2B1	1230	4500	38/38	1000	.2
13	2C1	1235	5000	370/370	1000	.3
14	2B1	1240	4800	370/370	900	.2
15	2A1	1245	3500	370/370	900	.1
16	002	1250	5200	370/430	1100	.3
17	1A2	1255	4600	370/550	1200	.3
18	1B2	1300	6500	370/3300	10000	2
19	1B3	1305	4500	900/2300	Contam.	1.5
20	1A3	1310	4400	700/3900	Contam.	.5
21	003	1315	5000	650/650	Contam.	.3
22	003	1320	6000	500/500	2200	.3
23	2A3	1325	4000	600/600	2200	.3
24	2B3	1330	3700	700/700	2200	.3

TABLE A.2 (Cont'd)

Report Number	Grid Position (Ref. Fig. A.2)	Time of Report (PST)	Mean Sea Level Altitude (Ft.)	B-21 Meter Reading (Millivolts B.G./B.G. Cont.)	Rate Meter Reading (Counts/Min)	Geiger Mueller Reading (Mr/Hr)
26	-	-	-	-	-	-
27	2D4	1345	2700	560/710	180	.3
28	2D4	1350	4000	650/650	1700	.3
29	2B4	1355	5200	670/670	1800	.3
30	2A4	1400	5800	650/650	1700	.3
31	1A5	1405	5200	660/660	1800	.3
32	1B5	1410	9000	570/570	1600	.4
33	2C5	1415	7500	600/600	1600	.3
34	2D0	1420		00/00	1600	.4
35	2E5	1425	2600	570/570	1700	.4
36	2F5	1430	2600	550/550	1700	.3
37	2F6	1435	2500	600/600	1600	.3
38	2E6	1440	3600	600/600	1600	.2
39	2D6	1445	3500	600/600	1600	.3
40	2C6	1450	3500	610/610	1500	.2
41	2B6	1455	4500	590/590	1400	.11
42	2A6	1500	4500	600/600	1400	.3
43	2A7	1515	5000	600/600	1410	.3
Badger II						
1	2C2	1230	Climbing	65/65	10	
2	2A3.1	1245	10000	85/90	10	.02
3	1A3.1	1250	10000	12500	Off Scale	.4
4	1A3.1	1300	10000	11500	Off Scale	.6
5	1A3.1	1320	10000	11000/11000	Off Scale	.15

TABLE A.2 (Cont'd)

Report Number	Grid Position (Ref. Fig. A.2)	Time of Report (PST)	Mean Sea Level Altitude (Ft.)	B-21 Meter Reading (Millivolts B.G./B.G Cont.)	Rate Meter Reading (Counts/Min)	Geiger Mueller Reading (Mr/Hr)
6	1A9.1	1330	10000	1100/1100	Off Scale	.7
7	1A80	1340	19000	(EG1000 PK1350)	Off Scale	.2
8	2B90	1355	10000	(PK 330)	Off Scale	.2
9	2D90	1410	10000	100/340	Off Scale	.2
10	3A51	1420	10000	100/330	Off Scale	.1
11	4A81	1430	10000	100/385	Off Scale	.2
12	4A82	1440	10000	100/312	Off Scale	.5
13	3B2	1450	10000	100/320	Off Scale	.3
14	3E2	1500	10000	100/300	Off Scale	.15
15	3D3	1510	10000	100/300	860	.5

Table A.3

Aerial Cloud Trackers' Report (Hounddog I and IV) - Shot 1 - 1 April 1952 (See Fig. A.2)
(Code: Hounddog - B-29 aircraft.)

Report Number	Grid Position (Ref. Fig. A.2)	Time of Report (PST)	Mean Sea Level Altitude (Ft)	B-21 Meter Reading (Millivolts B.G./B.G.Cont.)	Rate Meter Reading (Counts/Min)	Geiger Mueller Reading (Mr/Hr)
HOUNDDOG I						
1	207	1050	25,000			.08
2	204	1115	21,000			.8
3	1A5	1145	21,000			.08
4	106	1200	21,000			1
5	107	1209	21,000			2
6	2A8	1221	21,000			.5
7	107	1236	21,000			.7
8	1A8	1251	21,000			.9
9	1A9	1314	21,000			.2
10	1A9	1328	19,000			10
11	1A10	1335	19,000			.7
12	1B11	1357	19,000			.4
13	1A11	1412	19,000			3
14	1B14	1427	19,000			6
15	1B15	1436	19,000			5
16	1B15	1459	17,000			10
17	1B15	1514	17,000			7
HOUNDDOG IV						
1	2A0	0934	10,000			14
2	2A1	0946	11,500			180
3	2A2	1000	12,000			110
4	2A3	1015	12,000			25
5	2A4	1027	12,000			18
6	2A4	1042	12,000			80

TABLE A.3 (Cont'd.)

Report Number	Grid Position (Ref. Fig. A.2)	Time of Report (PST)	Mean Sea Level Altitude (Ft)	B-21 Meter Reading (Millivolts B.G./B.G.Cont.)	Rate Meter Reading (Counts/Min)	Geiger-Mueller Reading (Mr/Hr)
7	205	1058	12,000			27
8	106	1115	12,000			11
9	2B7	1133	12,000			50
10	2A8	1145	12,000			60
11	2A8	1200	12,000			360
12	2A8	1216	12,000			28
13	2A8	1230	12,000			110
14	2B9	1244	12,000			95
15	2A10	1258	12,000			90
16	2A10	1314	12,000			28
17	109	1329	12,000			75
18	1010	1342	12,000			85

EXPLANATORY NOTES FOR THE FIXED AIR SAMPLING AND FALL-OUT TRAY TABLES
(Tables A.4, B.4, C.4, D.4, E.4, F.4, G.4 and H.4)

COLUMNS 1 and 2: Indicate code name and name of the actual location of the air sampling and fall-out stations.

COLUMN 3: Indicates the air concentration of beta activity in microcuries per cubic meter of air sampled. SUB-COLUMNS headed by:

"TOTAL VOL": shows the air concentration for the total amount of air sampled.

"1 HR": Shows the maximum concentration that could be obtained if all the fall-out occurred during 1 hour. This was done for Shots 1, 2, and 3. For Shots 5, 6, 7 and 8, the filters were changed every hour so that it was possible to give actual maximum beta activity concentration during the fall-out periods.

"24 HRS": gives beta activity air concentration during the 24-hour period after detonation.

All activities have been extrapolated to the time of fall-out. During the first four shots of TUMBLER-SNAPPER, the time of fall-out was unknown; hence, it was assumed that the actual fall-out occurred between H plus 2 and H plus 4 hours. During the last four shots, because the filter papers were changed hourly, it was possible to determine the actual period of fall-out quite accurately; hence, the errors of extrapolation were minimized.

COLUMN 4: Refers to the beta activity of the fall-out trays. Subcolumn headed by:

"d/m" or "d/m/ft^2": gives the beta activity in disintegrations/minute for the total area of the tray or the disintegrations/minute for each square foot of tray surface.

The other 2 sub-columns in Column 4 are self-evident.

COLUMN 5: Refers to particle size and specific activity of particles as determined from impactor data. SUB-COLUMN headed by:

"MMD": refers to particle size in microns such that 50 per cent of the activity is in particles less than the size given and 50 per cent of the activity is in particles greater than the particle size shown.

The rest of the Table is self-evident.

TABLE A.4

Fixed Air Sampling and Fall-out Tray Report - Shot 1 - 1 April 1952

CODE	STATION	AIR CONCENTRATION IN μc/m^3			FALL-OUT TRAYS			PARTICLE SIZE		BACKGROUND RECORDER	
		Total Vol.	1 Hr.	24 Hrs.	d/m	Part/Tray	μc/Part	MMD	>5μ	Arrival Time	High Reading mr/hr
M	Mercury	53.1×10^{-6}	$.467\times10^{-3}$	$19.\times10^{-6}$	9800	0	-	-	-	1020	.3
GM	Groom Mine	.311	2.49	.104	6.9×10^{6}	203	.010	-	-	1255	-
LM	Lincoln Mine	$68.\times10^{-6}$	$5.\times10^{-3}$	21×10^{-6}	342,000	5	.021	-	-	-	-
IS	Indian Springs	23.6×10^{-6}	$.165\times10^{-3}$	7×10^{-6}	1340	0	-	-	-	-	-
LV	Las Vegas	39.4×10^{-6}	$.286\times10^{-3}$	12×10^{-6}	1730	0	-	-	-	-	-
NE	Nellis	3.6×10^{-6}	$28.\times10^{-6}$	1×10^{-6}	24,500	0	-	-	-	-	-
GJ	Glendale Jct.	45.9×10^{-6}	$.532\times10^{-3}$	24×10^{-6}	28,650	1	.0086	-	-	1020	-
AL	Alamo	.0149	.358	.0149	$.79\times10^{6}$	18	.0132	-	-	-	1.5
CS	Crystal Springs	3.4×10^{-6}	82×10^{-6}	3×10^{-6}	3.04×10^{6}	110	.0083	-	-	No Recorder	
CA	Caliente	.129	3.42	.142	4.56×10^{6}	92	.0149	-	-	1535	-
PI	Pioche	13.1×10^{-6}	$.111\times10^{-3}$	5×10^{-3}	13.0×10^{6}	423	.0092	-	-	-	-
ELY	Ely	.016	.384	.016	2.44×10^{6}	92	.0080	1.4	96	-	-
CU	Currant	.0725	1.81	.0755	2.97×10^{6}	92	.0097	-	-	No Recorder	
WS	Warm Springs	-	-	-	-	-	-	-	-	-	-
TO	Tonopah	-	-	-	11,800	0	-	-	-	-	.04
BE	Beatty	$45.\times10^{-6}$	$.405\times10^{-3}$	17×10^{-6}	1530	0	-	-	-	-	.04
CP	CP	.0239	.161	.00671	600,000	73	.0033	-	-	1010	2.0

TABLE A.5

Weather Data - Rawin Readings Taken at CP - Shot 1 - 1 April 1952

Time (PST)	Altitude in Ft. m. s. l.	Direction in Degrees	Speed in Knots
0940	Surface	50	06
	5,000	90	05
	6,000	120	05
	7,000	140	07
	8,000	170	08
	9,000	200	08
	10,000	210	10
	12,000	250	15
	14,000	250	14
	15,000	260	17
	16,000	260	20
	18,000	260	34
	20,000	260	37
	23,000	260	46
	25,000	260	43
	30,000	270	64

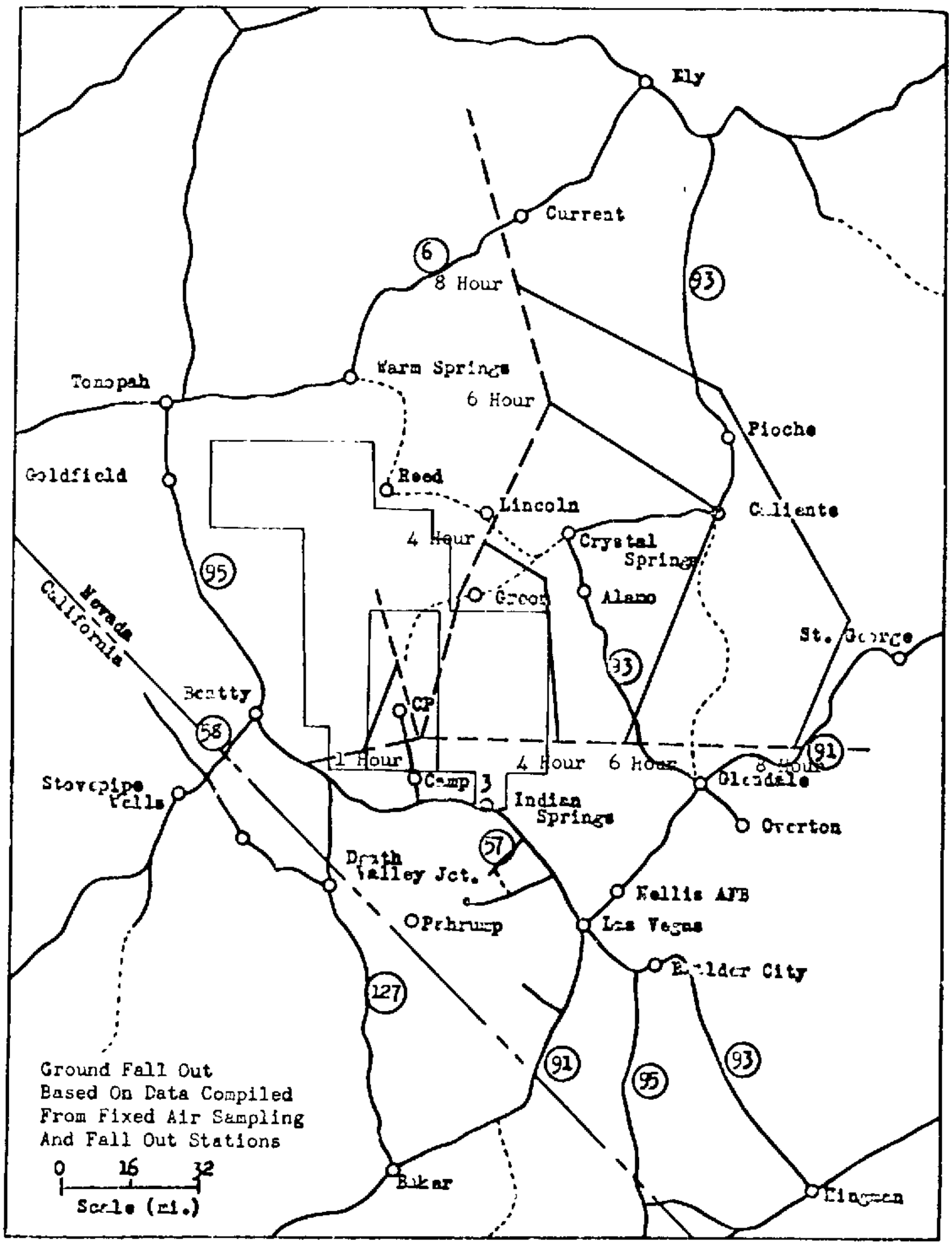


Fig. A.3 Fall-out Plot, Shot 1

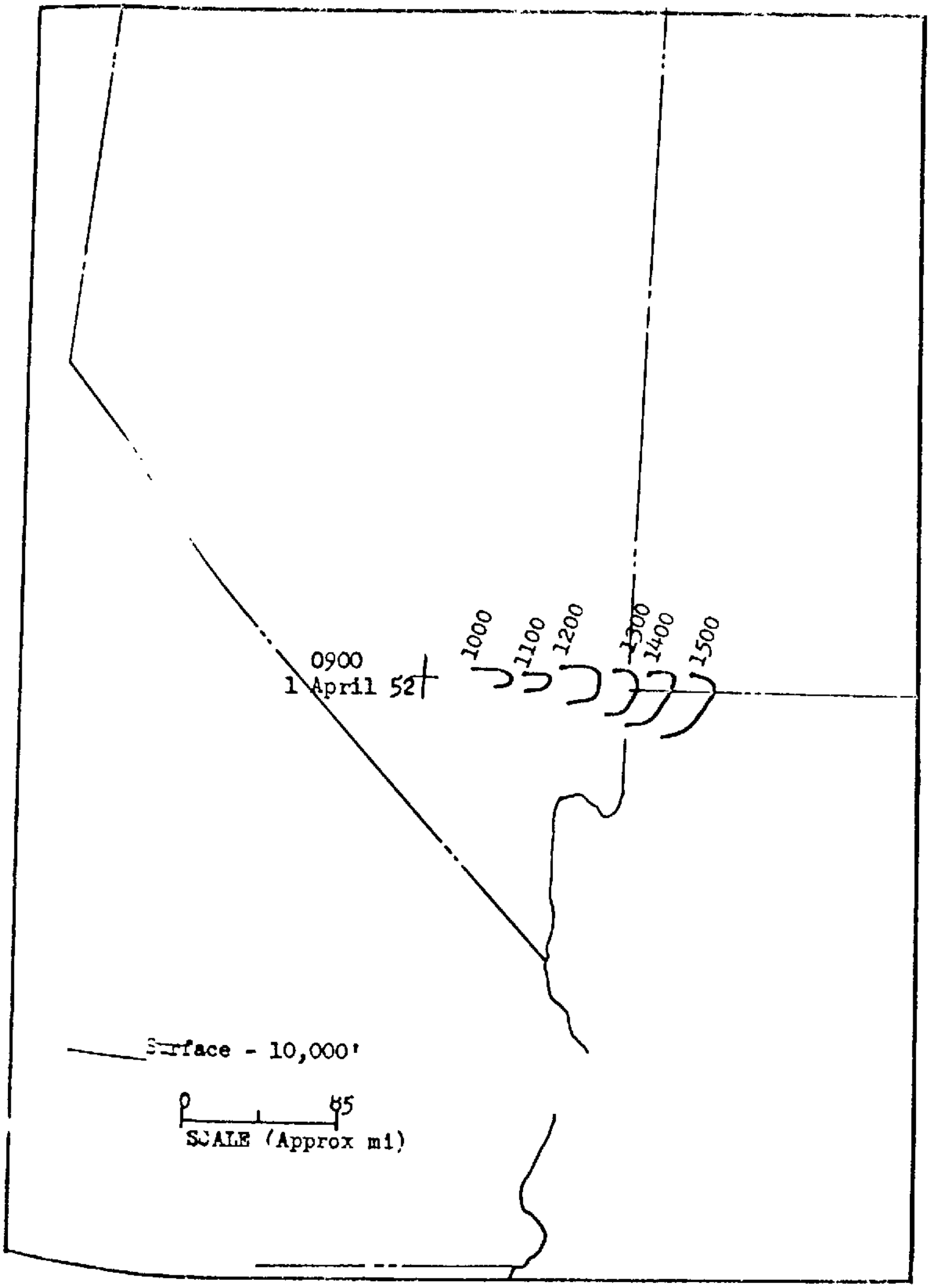


Fig. A.4 Cloud Progression, Shot 1

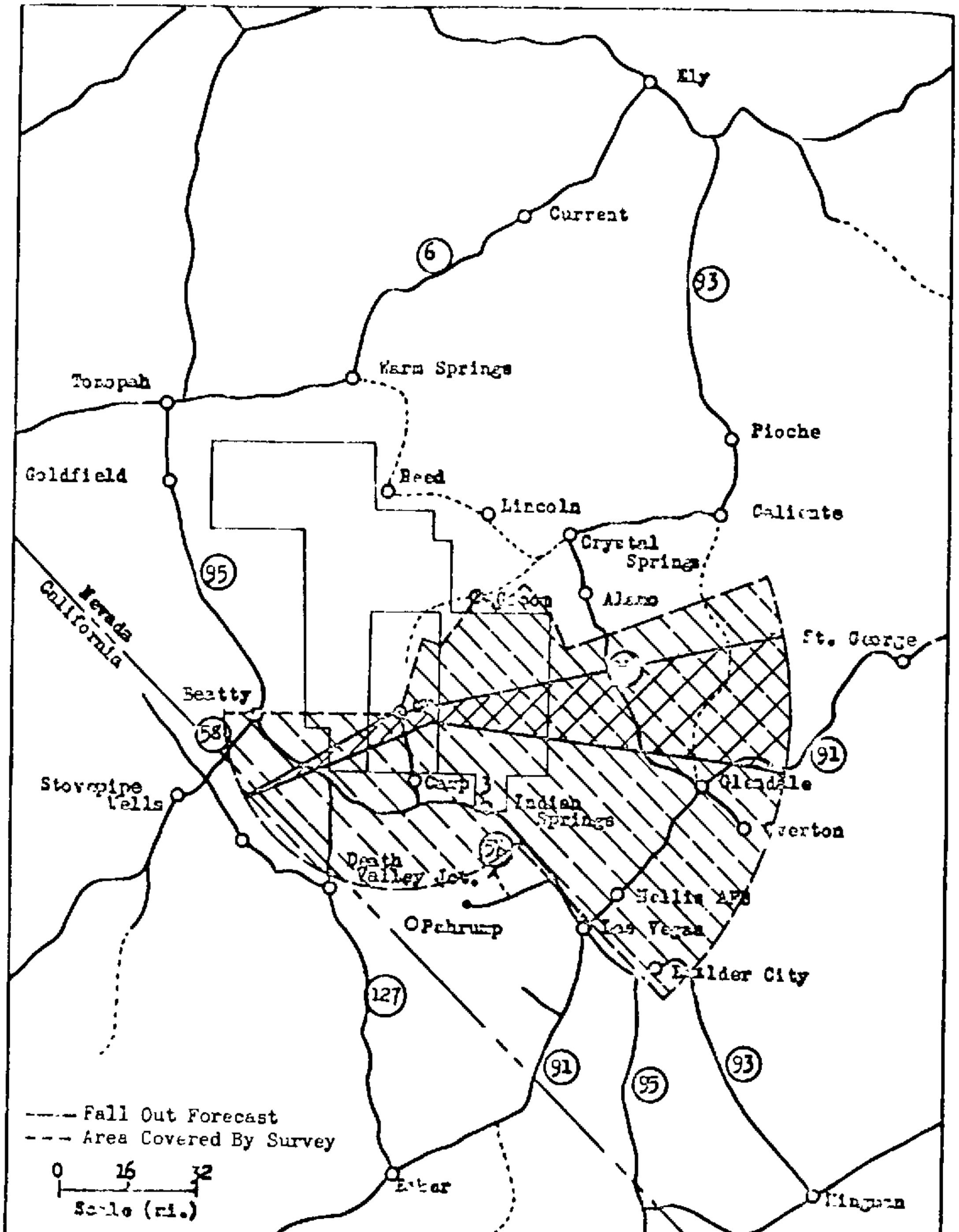


Fig. A.5 Fall-out Forecast and Area Covered by Surveys, Shot 1

TABLE A.6

Monitor's Survey Report - Shot 1 - 1 April 1952

Stake Number	Intensity (Mr/Hr) 1 Apr 52 (H+1 Hrs)	1 Apr 52 (H+5:30 Hrs)	2 Apr 52 (H+22:30 Hrs)	3 Apr 52 (H+49:20 Hrs)
200	900	950	320	90
201	900	750	120	40
202	1200	390	80	22
203	900	170	30	12
204	270	77	14	3.5
205	70	47	6	2
206	44	20	4	1
207	21	12	2	
208	10	4.5	1	
209	9	4.8		
210	3	1.5		
211	1	.5		

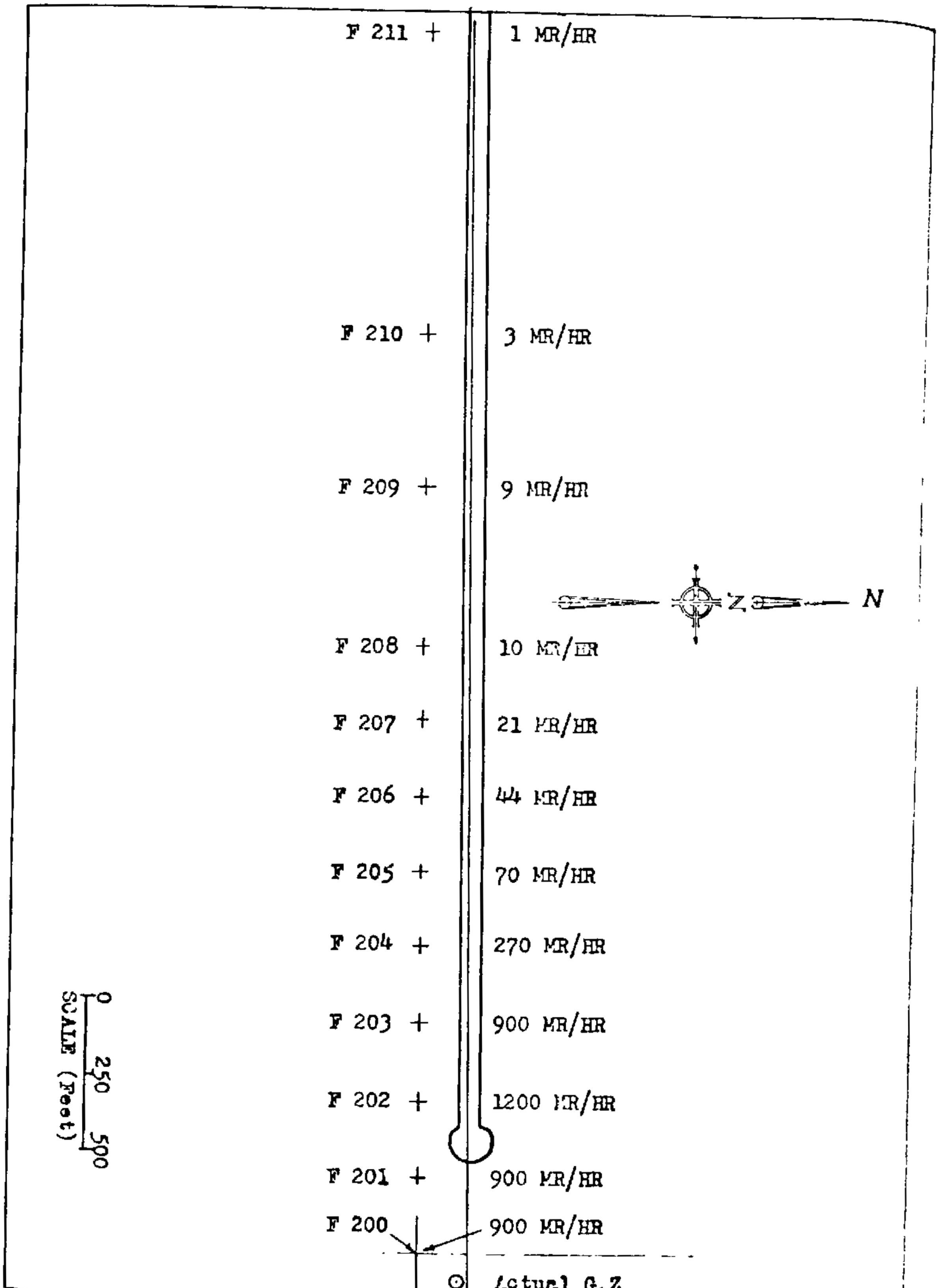


Fig. A.6 Base Map of Target Area at H + 1 Hour (0955), Shot 1

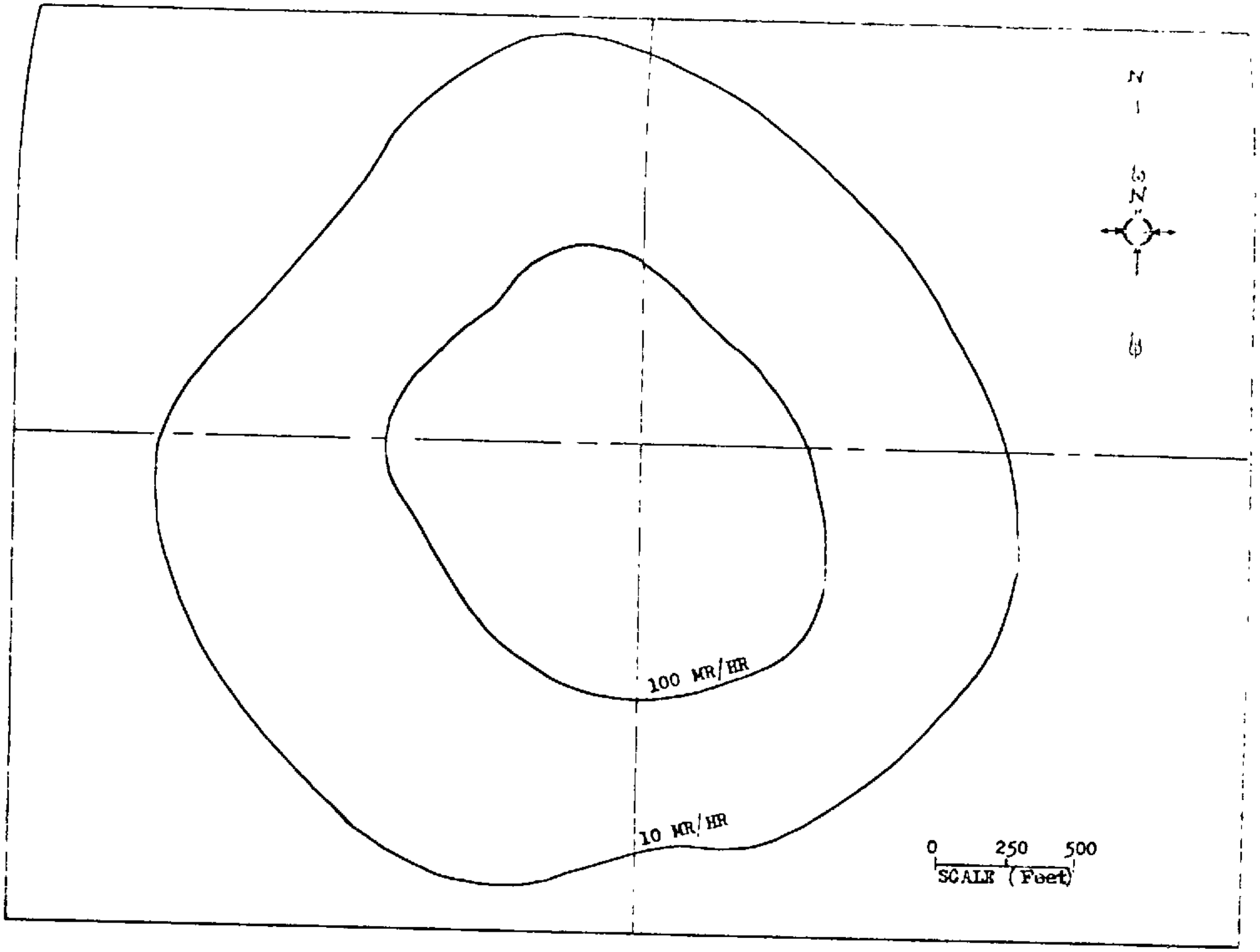


Fig. A.7 Isointensity Overlay - 1400-1500 - Shot 1 (See Fig. A.6)

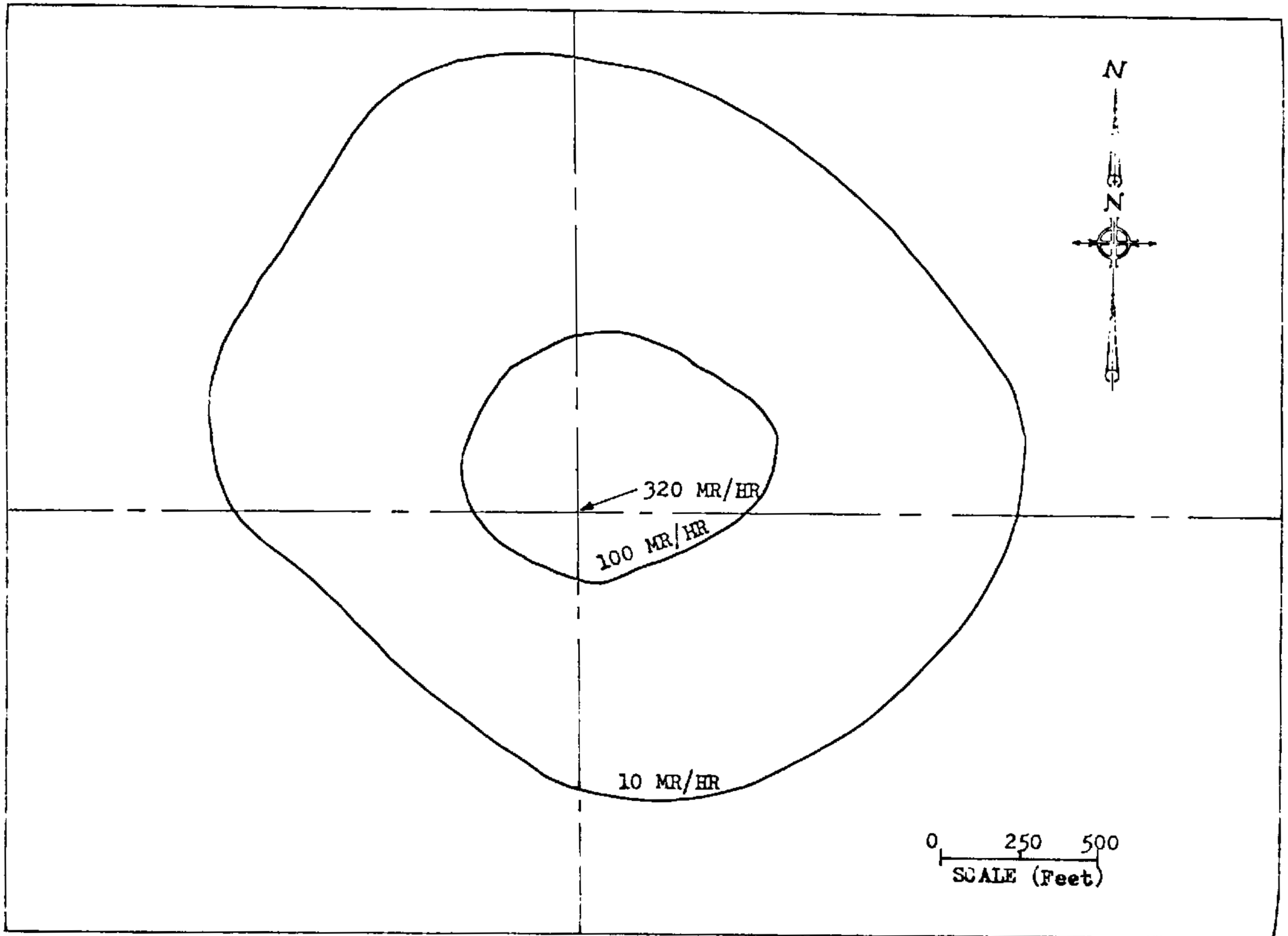


Fig. A.7.1 Isointensity Overlay, 0730, Shot 1 (See Fig. A.6)

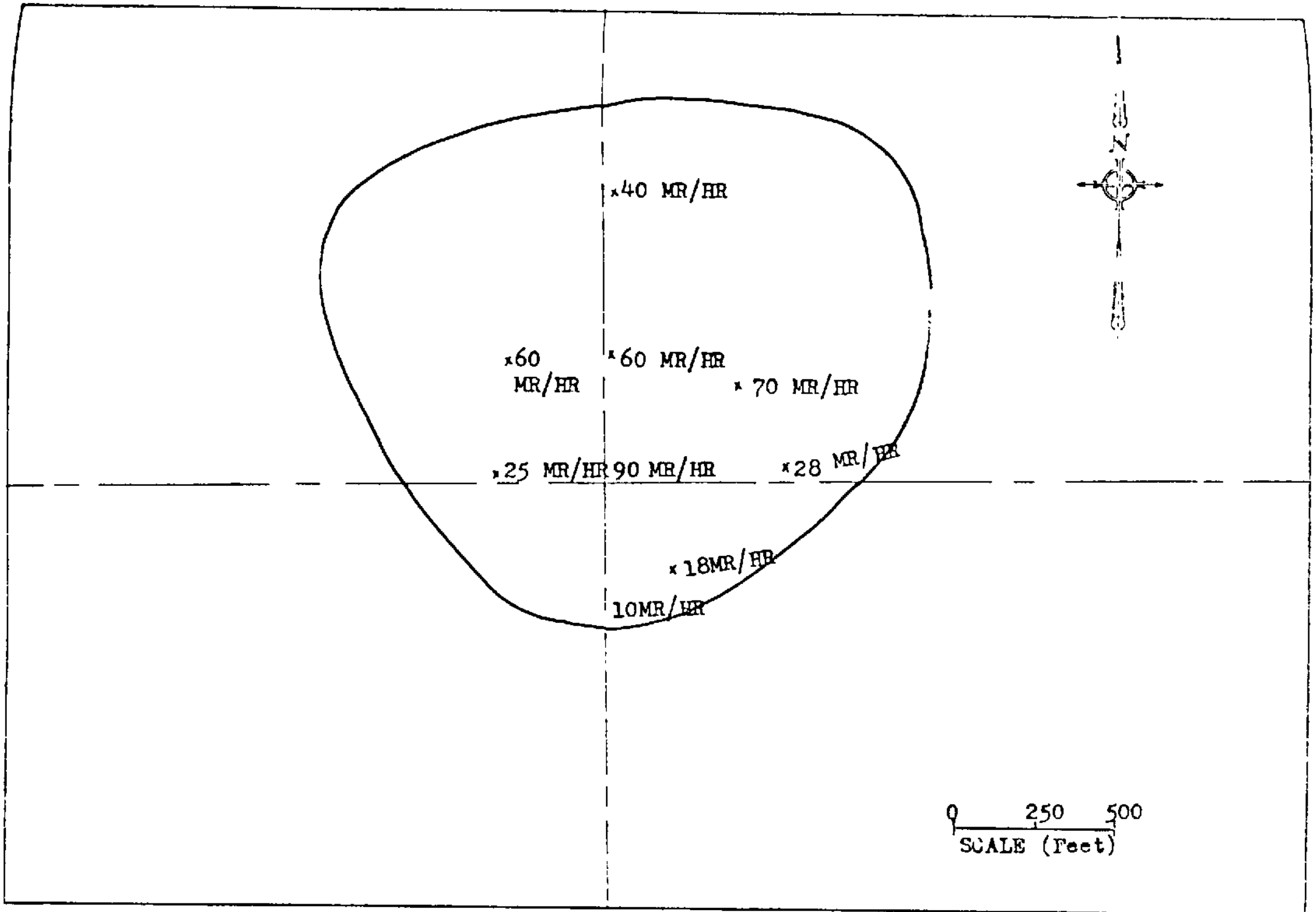


Fig. A.7.2 Isointensity Overlay, 0730, Shot 1 (See Fig. A.6)

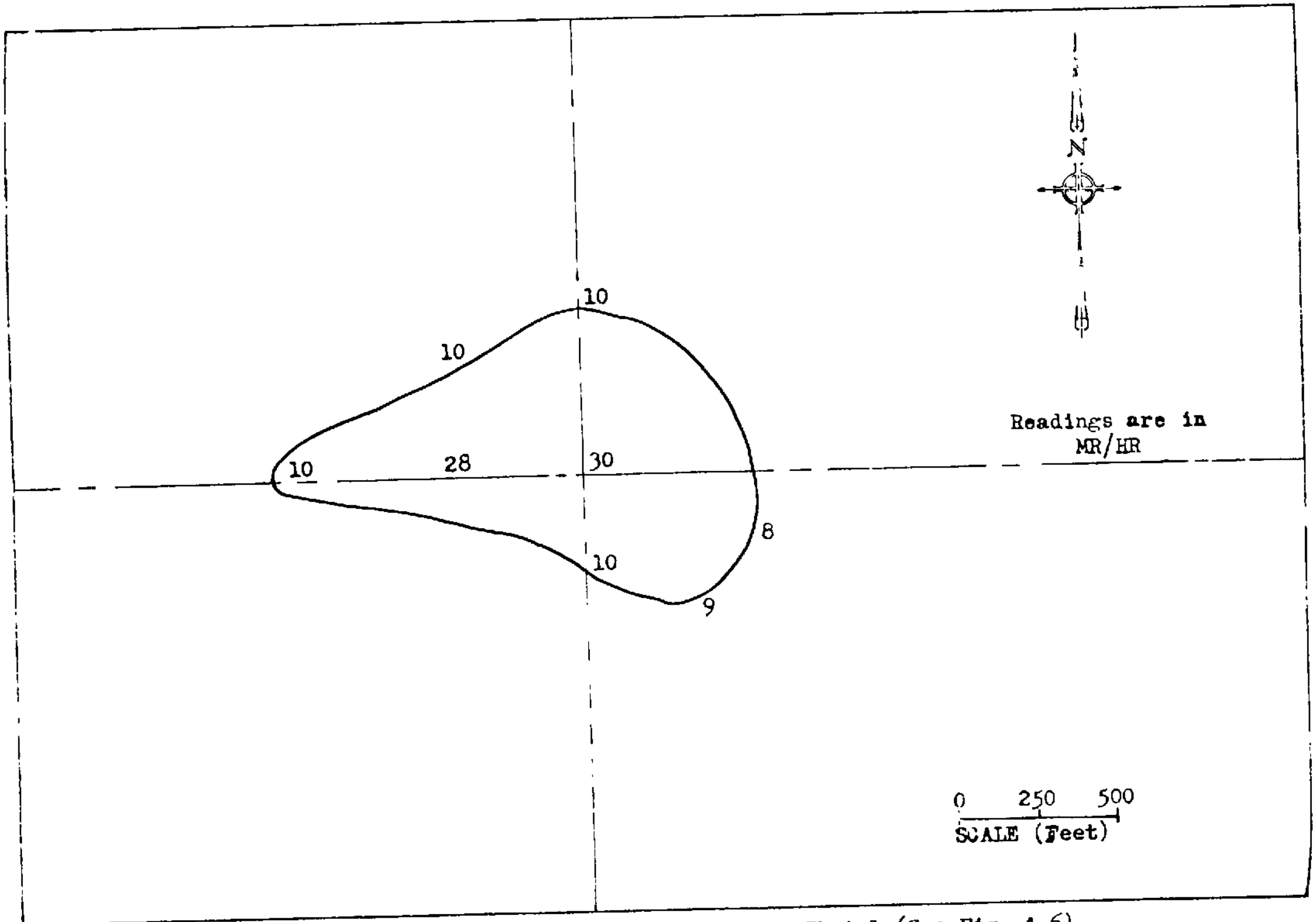


Fig. A.7.3 Isointensity Overlay, 0730, Shot 1 (See Fig. A.6)

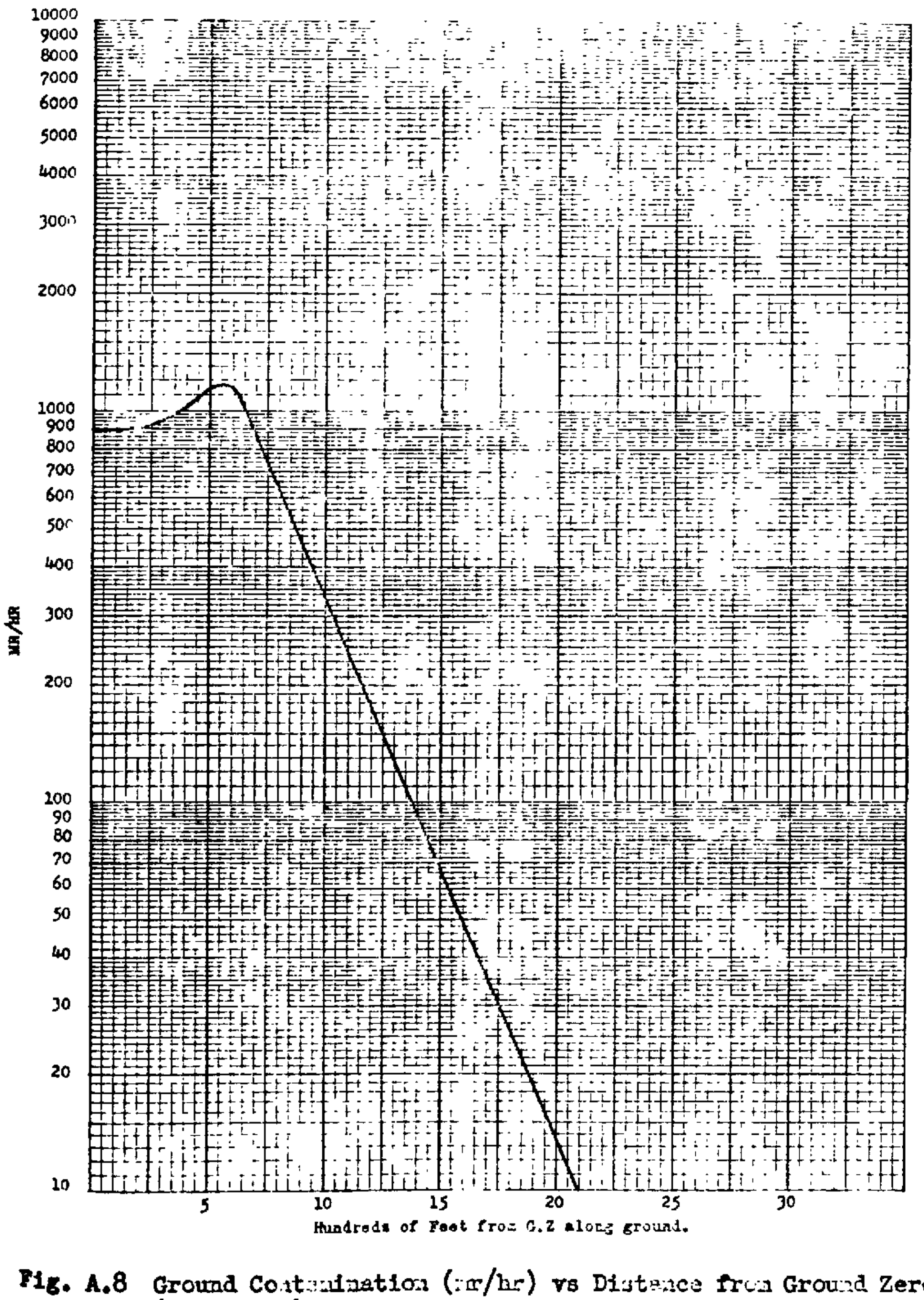


Fig. A.8 Ground Contamination (mr/hr) vs Distance from Ground Zero (H+1 hour), Shot 1

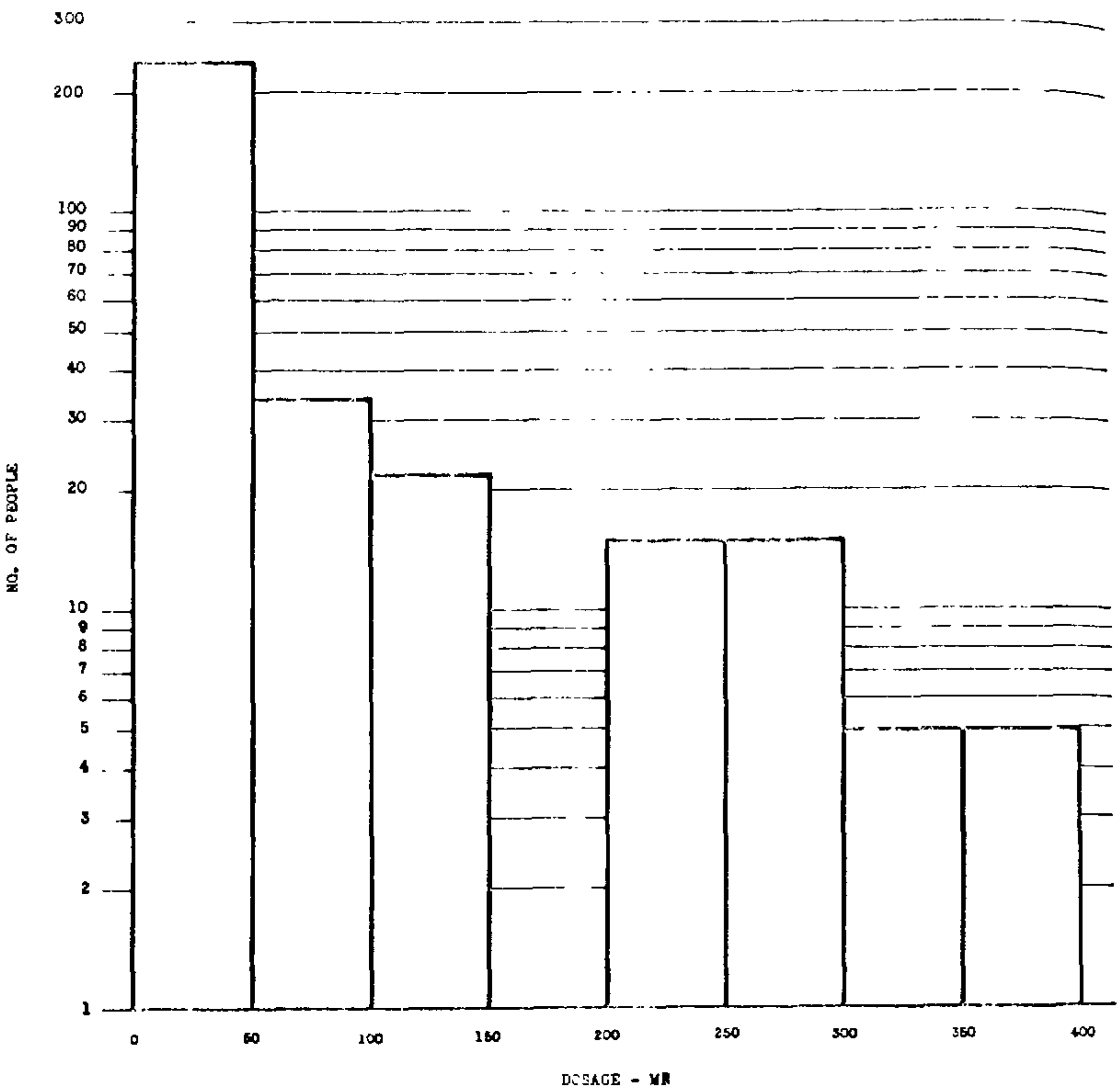


Fig. A.9 Accumulated Dose Report, Shot 1 (For personnel issued film badges during period A to B-1 days)

APPENDIX B

OPERATION TUMBLER-SNAPPER
Shot 2 - 15 April 1952
(Period Covered: 15 April - 21 April 1952)

OPERATIONAL DATA

Location: Area 7 - Station 3
Height of Burst: 1109 ft. stet
Yield (KT): 1.15
Time Fired: 0929 (PST)

OPERATION TUMBLER-SNAPPER
Shot 2 - 15 April 1952

B.1 OFF-SITE OPERATIONS DEPARTMENT

On 15 April 1952, at 0929, ______ weapon was detonated at 1109 feet in Area 7, Station 3. During the two weeks between the first and second shots, Off-Site Operations Department personnel made numerous off-site reconnaissance surveys to determine road conditions and the efficiency of the communications system. A map was prepared showing the areas of good reception moderate reception and no reception. Beginning on B-1 Day, fall-out plots and cloud trajectories were calculated from forecast winds. These plots were continually reviewed and changed as new wind data became available. A few minor changes were made in the operational procedures to eliminate deficiencies experienced during Shot 1. A composite fall-out plot based on the forecast winds and the actual measured winds at H One-half hour agreed very closely with the actual fall-out measured by the ground mobile monitors and the ground air sampling stations. No significant intensities from Shot 2 were measured off site. The data obtained by the Off-Site Operations Department during this time interval are shown in Tables B.1 through B.5 and Figures B.1 through B.4.

B.2 MATERIEL AND LOGISTICS DEPARTMENT

There was sufficient time in the two weeks between the first and second shots for all sections to make variations in their standing operating procedure, request additional facilities, or requisition and obtain additional supplies. Only 392 units of protective clothing and equipment were issued during this test period. The level of contamination was low, and the decontamination procedures were effective. The information outlined in the following paragraphs resulted from the experience gained during the first shot.

It was not necessary to make a daily trip to Indian Springs with contaminated protective clothing, since the level of radioactive contamination in the area was low and a large amount of the clothing that was above the tolerance value limits could be reduced below these limits by vacuum cleaning and brushing.

Approximately 5 per cent of the personnel drawing protective clothing did not return it within the allotted five days, so that a system of writing memorandums of delinquency to these individuals was initiated.

An inclosure in front of the Instrument Repair Shop was desirable to facilitate the issuance, receipt and storage of radiac instruments.

A new type of calibration board for film badges was

desirable. This new calibration board was constructed using the principle of varying the distance of the film badges to be calibrated from a known source for a specified time, as compared with the older procedure of varying the time of exposure at a constant distance. This new method was more accurate and saved time.

It was more satisfactory to issue 4.5 density goggles on an individual, daily basis than on bulk issue to organizations and projects. This was necessary because many organizations and projects requested more goggles than they had personnel, and the requests included many duplications for the same individuals, which created an artificial shortage of goggles when actually no shortage existed. Furthermore, the lenses of approximately 20 per cent of the goggles returned were scratched and marred by improper care to such an extent that the goggles were unserviceable and had to be replaced.

Although the 90 MX-5 radiac instruments were sufficient for the operation, a control of these issues had to be initiated to insure that monitors whose jobs required their use received them and that they were kept in proper repair and calibration.

B.3 ON-SITE OPERATIONS DEPARTMENT

For the second and subsequent nuclear shots of this test series eight radial lines of numbered wooden stakes were placed 100 yards apart in the target area (see Fig. B.5) and the area survey teams measured the intensities at these positions. The responsibility for placing the stakes was assigned to the officer in charge of the initial survey teams. Based upon data furnished by this officer, the base map (see Fig. B.5) and the isointensity plots (Figs. B.6 through B.6.4) were prepared by personnel of the Plotting and Briefing Section. Tabulations of readings taken by the initial post-shot area survey teams are shown in Table B.6 for Shot 2 on shot day, shot day+1, and shot day+2. It will be noted that detailed reports of intensity readings at consecutively numbered stakes were made for the (Shot 2) initial post-shot survey to obtain complete data on the radiological contamination in the target area. These surveys were continued until such time as the residual contamination was found to have decayed to less than 10 mr/hr, after which the area was declared "open" and Rad-Safe requirements for entering the area were no longer necessary. Ground contamination (mr/hr) versus distance from ground zero is shown in Figure B.7. Seventeen programs and 66 projects were scheduled for participation in test activities for this shot by the Test Director's Operational Order 1-52, Annex B. In addition to the scheduled technical recovery and work parties, this department assigned and dispatched approximately 30 additional monitors on shot day and 11 on shot day+1. In those instances where scheduled recovery work was not completed at the end of shot day+1 and the radiological situation so warranted, additional monitors were assigned to accompany recovery parties into the target area as required.

As for Shot 1, the radiation level in the target area after this burst were low, (a maximum of 1200 mr/hr at ground zero). Personnel and vehicle decontamination activities were also light for this shot. For the same reason, accumulated individual doses of personnel working in the target area after the detonation were quite low. (See Fig. B.8.)

TABLE B.1

Ground Mobile Monitors' Report - Shot 2 - 15 April 1952. (See Fig. A.1). (Normal background: .02 - .04 mr/hr.)

TIME	READING Mr/Hr	GRID LOCATION (Ref.Fig. A.1)	LOCATION IN DETAIL	REMARKS
0900	.02	E2 S4	Lincoln Mine	
0930	.03	E2 S2	Groom Mine	
1030	.03	E2 S2	Groom Mine	
1130	.04	E2 S2	Groom Mine	
1140	.03	E0 T3	US 95 & Mercury Rd.	
1145	.02	F0 T2	15 mi.N of Las Vegas on US 91/93	Radio Contact Garbled
1145	.03	E2 S4	Lincoln Mine	
1150	.02	E5 T1	Las Vegas	
1150	.02	E1 T3	15 mi.E of Mercury on US 95	
1200	.02	E1 T3	22 mi. E of Mercury on US 95	
1200	.01	E5 T0	7 mi.S of Las Vegas on US 91/466	Radio Reception 5x5
1210	.02	E1 T3	27 mi. E of Mercury on US 95	
1215	.02	D3 T4	2 mi. NW Lathrop Wells on US 95	
1220	.02	E3 T2	Jct. Nev 52/US 95	
1220	.02	C5 T3	Stovepipe Wells	
1225	.02	E5 T0	20 Mi. S of Las Vegas on US 91/466	
1225	.01	D3 T1	Death Valley Jct.	
1230	.04	E2 S2	Groom Mine	
1235	.03	E3 T2	5 mi. fm. US 95 on Nev 52	
1250	.02	E4 U5	Jean,Nev. (30 Mi. S of Las Vegas on US 91/466	No Radio Control
1255	.02	E2 T2	10 mi. from US 95 on Nev. 52	Cloud seems to be approaching
1305	.5	D3 T3	1 mi. E of Lathrop Wells on US 95	
1315	.5	D4 T3	3 mi. E of Lathrop Wells on US 95	
1315	.01	D2 T2	30 mi. W Death Valley Jct. on Cal 190	
1325	.7	D4 T3	10 mi. E of Lathrop Wells on US 95	
1330	.01	D1 T2	Furnace Creek	
1330	.04	E2 S2	Groom Mine	
1330	.03	E2 T2	10 mi. from US 95 on Nev 52	Direction of cloud appears to have changed
1330	.02	E3 U5	10 mi. W of Jean on Nev 85	
1330	.2	D5 T3	15 mi. E of Lathrop Wells on US 95	
1345	.05		Hut #23, Mercury	
1350	.02	E2 T2	10 mi. from US 95 on Nev 52	
1355	.02	E4 U5	Jean, Nev.	
1400	.2	D5 T3	10 mi. E of Lathrop Wells on US 95	

TABLE B.1
(Cont'd.)

TIME	READING Mr/Hr	GRID LOCATION (Ref.Fig. A.1)	LOCATION IN DETAIL	REMARKS
1400	.01	D2 T2	30 mi. W of Death Valley Jct. on Cal 190	
1400	.02	D1 T2	5 mi. N of Furnace Creek	
1415	.2	D4 T3	On US 95	
1415	.04		Hut #23, Mercury	
1425	.02	E5 T1	5 mi. S of Las Vegas	
1430	.05	D3 T1	Death Valley Jct.	
1430	.05		Hut #23, Mercury	
1430	.4	D4 T3	Lathrop Wells	
1430	.05	E2 S2	Groom Mine	
1440	.02	D1 T2	Furnace Creek	
1445	.05	D3 T1	Death Valley Jct.	
1445	.04		Hut #23, Mercury	
1445	.15	D3 T4	10 mi. W of Lathrop Wells on US 95	
1455	.03	D2 T2	30 mi. W Death Valley Jct - Cal 190	
1500	.1	D2 T4	15 mi. W Lathrop Wells on US 95	
1500	.03		Hut #23, Mercury	
1500	.01	E4 U5	Jean, Nevada	
1515	.02	D1 T2	Furnace Creek	
1515	.03		Hut #23, Mercury	
1525	.08	D1 T5	1/2 mi. S of Beatty on US 95	
1525	.3	E2 T2	11 mi. from US 95 on Nev 52	
1530	.01	D1 T2	Furnace Creek	
1530	.02	E4 U5	Jct US 91/Nev 53	
1545	1.3	E2 T2	11 mi. from US 95 on Nev 52	
1600	.01	E4 U5	Jean, Nevada	
1610	.01	D1 T2	Furnace Creek	
1610	.08	D3 T4	5 mi. W of Lathrop Wells on US 95	
1610	2.0	E2 T2	11 mi. from US 95 on Nev 52	
1617	3.0	E2 T2	11 mi. from US 95 on Nev 52	
1620	.01	E4 U5	Jean, Nevada	
1620	.03	D2 T2	35 mi. W Death Valley Jct - Cal 190	
1622	4.0	E2 T2	11 mi. from US 95 on Nev 52	
1625	5.0	E2 T2	11 mi. from US 95 on Nev 52	
1625	.08	D4 T3	5 mi. E of Lathrop Wells on US 95	
1630	.3	D4 T3	5 mi. W of Lathrop Wells on US 95	
1630	.02	C5 T3	4 mi. E Stovepipe Wells on Nev 58	
1635	.03	D3 T1	Death Valley Jct.	
1645	.1	D5 T3	10 mi. E of Lathrop Wells on US 95	
1650	.01	E4 U5	Jean, Nev.	
1700	.03	D3 T1	Death Valley Jct.	
1700	.02	D1 T2	Furnace Creek	
1710	6.0-7.0	E2 T2	11 mi. from US 95 on Nev 52	

TABLE B.1
(Cont'd)

TIME	READING Mr/Hr	GRID LOCATION (Ref.Fig. A.1)	LOCATION IN DETAIL	REMARKS
1715	.01	E4 U5	Jean, Nev.	
1720	.01	E4 U5	Jean, Nev.	
1720	3.0	E2 T2	11 mi. from US 95 on Nev 52	
1725	3.0	E2 T2	11 mi. from US 95 on Nev 52	
1730	.03	D3 T1	Death Valley Jct.	
1740	2.0	E2 T2	11 mi. from US 95 on Nev 52	
1745	.02	D3 T3	20 mi. N of Death Valley Jct on Nev 29	
1800	.01	E5 T1	Las Vegas, Nev.	
1800	.02	D3 T3	20 mi. N of Death Valley Jct. Nev 29	
1800	.02	E2 S4	Lincoln Mine	
1810	2.0	E2 T2	11 mi. from US 95 on Nev 52	
1815	.01	D4 T3	Lathrop Wells	
1820	1.5	E2 T2	11 mi. from US 95 on Nev 52	
1900	.2-.5		Lathrop Wells to US 95/Mercury Rd.	

TABLE B.2

Aerial Terrain Survey Report (Badger I, II and Woodchuck I - Shot 2 - 15 April 1952 (See Fig. A.2).) (Code: Badger - C-47 aircraft. Woodchuck - L-20.)

Report Number	Grid Position (Ref. Fig. A.2)	Time of Report (PST)	Absolute Altitude (Ft)	B-21 Meter Reading (Millivolts B.G./B.G.Cont.)	Rate Meter Reading (Counts/Min)	Geiger Mueller Reading (Mr/Hr)
BADGER I						
1	1B2	1238	7000	75/75	40	0
2	1B0	1243	1000	75/140	40	0
3	4B1	1248	500	75/205	45	0
4	4B2	1253	500	80/100	45	0
5	4A2	1256	600	80/95	45	0
6	4A1	1302	400	75/90	40	0
7	4A0	1305	1000	80/990	100	0
8	1A0	1312	700	75/75	40	0
99	301	1319	400	75/170	80	0
10	3A3	1324	1000	70/70	40	0
11	3B5	1333	600	70/70	40	0
12	3B1	1340	1500	70/70	40	0
13	3B3	1343	700	70/70	40	0
14	3B2	1348	500	70/320	500	0
15	3B1	1354	500	70/475	1200	0
16	2B0	1357	600	75/120	1200	0
17	2B1	1400	1000	75/530	3000	1.5
18	2D3	1421	500	420/420		1.3
19	2E4	1431	1000	460/460	1800	1.1
20	2E3	1444	500	400/400	2000	1.2
21	3F2	1503	800	450/6000	10,000	7.5
22	3E4	1508				1.8
23	3D6	1520				1.5
24	3D8	1525				1.4
25	3D9	1530				1.4

TABLE B.2 (Cont'd.)

Report Number	Grid Position (Ref. Fig. A.2)	Time of Report (PST)	Absolute Altitude (Ft)	B-21 Meter Reading (Millivolts B.G./B.G.Cont.)	Rate Meter Reading (Counts/Min)	Geiger-Mueller Reading (Mr/Hr)
26	3D10	1533				1.4
27	3E10	1538				1.4
28	3F10	1542				1.4
29	3F9	1546				1.4
30	3F7	1551				1.4
31	3F6	1555				1.3
32	3F4	1602				1.4
33	3F3	1605				1.4
34	3F2	1610				2.0
35	3F1/2	1615				3.5
36	2F1	1620				1.5
37	2F2	1623				1.5
38	2F3	1628				1.5
39	2F4	1632	1200	2500/2500		1.5
40	2F5	1636				1.4
41	2F6	1641				1.4
42	2E4					1.4
43	2E2	1703				1.3
44	2E1	1707				2.0
45	2E0	1711				1.5
BADGER II						
1	3C3	1245	10,000	100/27,000	Neg.	.6
2	3D4	1300	10,000	1750/1750	Neg.	.4
3	3B2	1315	10,000	1550/2800	Neg.	.5
4	3C2½	1330	10,000	1500/2000	Neg.	.4-
5	3D2½	1345	10,000	1500/1500	Neg.	.4
6	3B1½	1400	10,000	1200/1200	Neg.	.3
7	3C1½	1415	10,000	1200/3000	Neg.	3.5
8	3F0	1430	10,000	10,000/10,000	Neg.	.4

TABLE B.2 (Cont'd.)

Report Number	Grid Position (Ref. Fig. A.2)	Time of Report (PST)	Absolute Altitude (Ft)	B-21 Meter Reading (Millivolts B.G./B.G.Cont.)	Rate Meter Reading (Counts/Min)	Geiger-Mueller Reading (Mr/Hr)
9	3D0	1445	10,000	850/880	4000	.5
10	2C½-1	1500	10,000	1300/1500	6500	3.0
11	2D0	1515	10,000	1000/8700	2000	.8
12	2G3	1530	10,000	2000/2000	3500	.5
13	2D4	1545	10,000	2000/2000	2800	.7
14	2C3	1548	10,000	2000/2000	2000	.5
15	2D3	1553	10,000	2000/2000	1500	.6
16	2F3	1600	10,000	2000/2000	500	.7
17	2F1	1006	10,000	1900/1900	300	.5
18	2D1	1612	10,000	1900/7000	10	8.0
19	2C1	1617	10,000	1900/18,000	0	24.0
20	3C3	1700	10,000	5300/5300	1400	1.2
WOODCHUCK I						
1	2C0	1502	100			.4
2	3C1	1508	100			.3
3	3C2	1513	200			.4
4	3C3	1517	100			.3
5	3C4	1521	1000			.4
6	3C5	1536	25			.3
7	3C6	1540	300			.3
8	3C½	1614	400			.8
9	3C½	1619	1000			.2
10	2B0	1630	800			.5

TABLE B.3

Aerial Cloud Trackers' Report - (Badger II, Hounddog I, II) - Shot 2 15 April 1952 (See Fig. A.2). (Code: Badger - C-47 aircraft. Hounddog - B-29.)

Report Number	Grid Position (Ref. Fig. A.2)	Time of Report (PST)	Mean Sea Level Altitude (Ft)	B-21 Meter Reading (Millivolts B.G./B.G.Cont.)	Rate Meter Reading (Counts/Min)	Geiger-Mueller Reading (Mr/Hr)
BADGER II						
1	2C2	1335	4000	3000/3000	2200	.1
2	2C3	1338	4000	3000/3000		.1
3	2C4	1342	4000	3000/3000		.09
4	2D4	1345	4000	3000/3000		.09
5	2E4	1348	5000	3150/3300		.02
6	2E3	1358	9000	3300/3600		.1
7	2E2	1402	9000	3200/3200		.1
8	2E1	1407	8000	3100/3100		.1
9	2D1	1412	8000	3100/3100	2800	.15
10	2D0	1415	7500	3000/3000	3200	.1
11	3D1	1418	7500	300/3000	3400	.08
12	3D2	1424	7500	3000/32,000	4000	.06
13	3D3	1428	7000	2900/2900		.05
14	3D4	1432	6500	2900/3000	3200	.05
15	3C5	1437	6500	2900/2900	3200	.03
16	305	1446	6500	2800/2800	3200	.02
17	4C4	1504	8000	2500/2800		.01
18	4D0	1520	7500	2300/2400		.01
19	1B5	1539	8500	2100/2100		.01
20	2B8	1557	5000	2000/2000		.01
21	2E5	1615	4000	2000/2000		.01
HOUNDDOG I						
1	2B4	1030	12,000			Neg.
2	2B2	1158	17,000			4.
3	2B2	1311	17,000			2.
4	2A1	1339	17,000			1.4

TABLE B.3 (Cont'd.)

Report Number	Grid Position (Ref. Fig. A.2)	Time of Report (PST)	Mean Sea Level Altitude (Ft)	B-21 Meter Reading (Millivolts B.G./B.G.Cont.)	Rate Meter Reading (Counts/Min.)	Geiger-Mueller Reading (Mr/Hr)
5	2B2	1238	15,000			1.5
6	2A2	1255	15,000			.5
7	2C3	1306	15,000			4.
8	2B0	1317	14,000			4.
9	2D0	1340	13,000			6.
10	2D4	1353	13,000			6.
HOUNDDOG II						
1	000	1001	9000	(South of Rosie)		.15
2	101	1015	12,000	(East of Rosie)		.1
3	40A	1027	10,000	(N.W. of Rosie)		.08
4	2A1	1043	6000	(East Edge of Rosie)		.12
5	2A1	1059	8500	(S.E. of Rosie)		1.
6	100	1113	9000	(N.W. of Rosie)		.15
7	2A0	1129	10,000			.12
8	2A2	1145	11,000	(E. of Rosie)		.2
9	2B2	1200	12,000	(E.-S.E. of Rosie)		1.
10	3D2	1215	15,000	(S. of Rosie)		2.
11	2B2	1230	7500			1.
12	2B1	1238	8000			3.

TABLE B.4

Fixed Air Sampling and Fall-out Tray Report - Shot 2 - 15 April 1952 *

CODE	STATION	AIR CONCENTRATION IN $\mu c/m^3$			FALL-OUT TRAYS			PARTICLE SIZE		BACKGROUND RECORDER High	
		Total Vol.	1 Hr.	24 Hrs.	d/m	Part/Tray	μc/Part	MMD	%<5 μ	Arrival Time	Reading Mr/Hr
M	Mercury	54.4×10^{-6}	1.32×10^{-3}	$.055 \times 10^{-3}$	42,500	6	2.15×10^{-3}	-	-	1145	.084
CP	CP	21.5×10^{-3}	526×10^{-3}	22×10^{-3}	12,570,000	35	0.11	-	-	1000	25
DVJ	Death Valley Jct.	4.46×10^{-3}	25.3×10^{-3}	1.05×10^{-3}	21,800	18	$.36 \times 10^{-3}$	-	-	-	-
LM	Lincoln Mine	3.41×10^{-6}	$.042 \times 10^{-3}$	1.74×10^{-6}	733	0	0	-	-	-	-
PI	Pioche	4.55×10^{-6}	$.107 \times 10^{-3}$	4.48×10^{-6}	3,780	0	0	-	-	-	-
GM	Groom Mine	8.68×10^{-6}	$.205 \times 10^{-3}$	8.54×10^{-6}	3,130	0	0	-	-	-	-
CS	Chrystal Spr.	15.5×10^{-6}	$.348 \times 10^{-3}$	14.5×10^{-6}	-	-	-	-	-	-	-
AL	Alamo	15.0×10^{-6}	$.360 \times 10^{-3}$	15.0×10^{-6}	9,620	0	0	-	-	-	-
NE	Nellis AFB	$.370 \times 10^{-3}$	9.05×10^{-3}	$.377 \times 10^{-3}$	91,900	0	0	1.05	90	-	-
IS	Indian Spr.	.107	2.52	.105	5,050,000	505	2.97×10^{-3}	-	-	-	-
GJ	Glendale Jct	16.8×10^{-6}	$.413 \times 10^{-3}$	17.2×10^{-6}	-	0	-	-	-	-	-
CU	Currant	0	0	0	1,510	0	0	-	-	-	-
ELY	Ely	0	0	0	23,200	0	0	-	-	-	-
CA	Caliente	17.4×10^{-6}	$.425 \times 10^{-3}$	17.7×10^{-6}	4,600	0	0	-	-	-	-
LV	Las Vegas	14.4×10^{-3}	353×10^{-3}	14.7×10^{-3}	494,000	122	1.2×10^{-3}	-	-	-	-
BE	Beatty	13.5×10^{-6}	$.328 \times 10^{-3}$	13.7×10^{-6}	4,100	0	0	-	-	-	-
WS	Warm Spgs.	2.56×10^{-6}	$.03 \times 10^{-3}$	1.25×10^{-6}	1,560	0	0	-	-	-	-
TO	Tonopah	16.2×10^{-6}	$.389 \times 10^{-3}$	16.2×10^{-6}	-	-	-	-	-	-	-

*See Explanatory Notes (Page 79)

TABLE B.5

Weather Data - Pibal Readings Taken at CP - Shot 2 - 15 April 1952

Time (PST)	Altitude in Ft. m. s. l.	Direction in Degrees	Speed in Knots
0640	Surface	40	09
	5,000	20	15
	6,000	20	20
	7,000	20	24
	3,000	20	22
	9,000	10	14
	10,000	360	11
	12,000	233	12
	14,000	340	15
	15,000	300	17
	16,000	280	18
	18,000	300	20
	20,000	300	26
	22,000	270	29
	23,000	290	32
	24,000	270	30
	25,000	280	34
	26,000	280	36

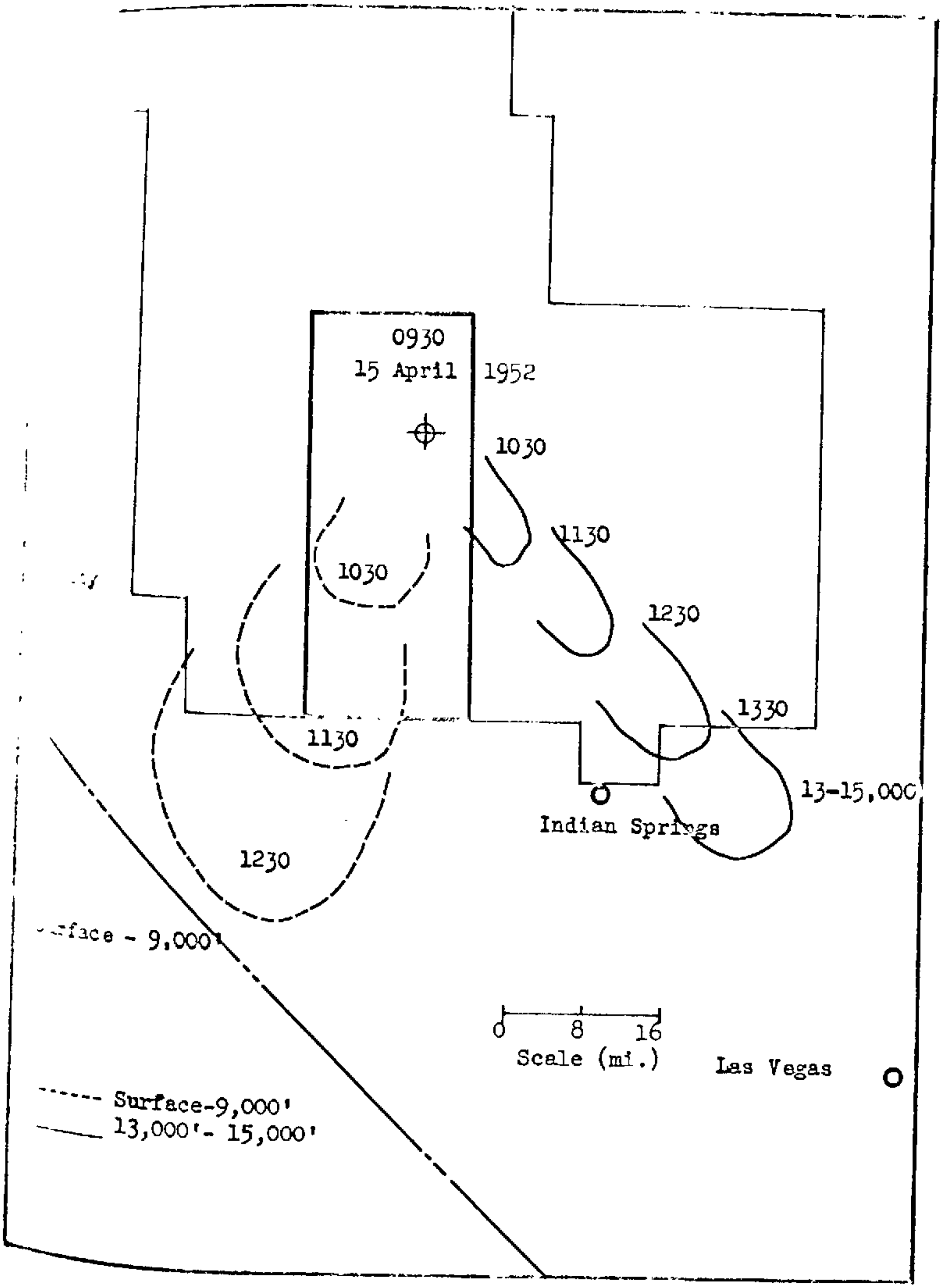


Fig. B.1 Cloud Progression, Shot 2

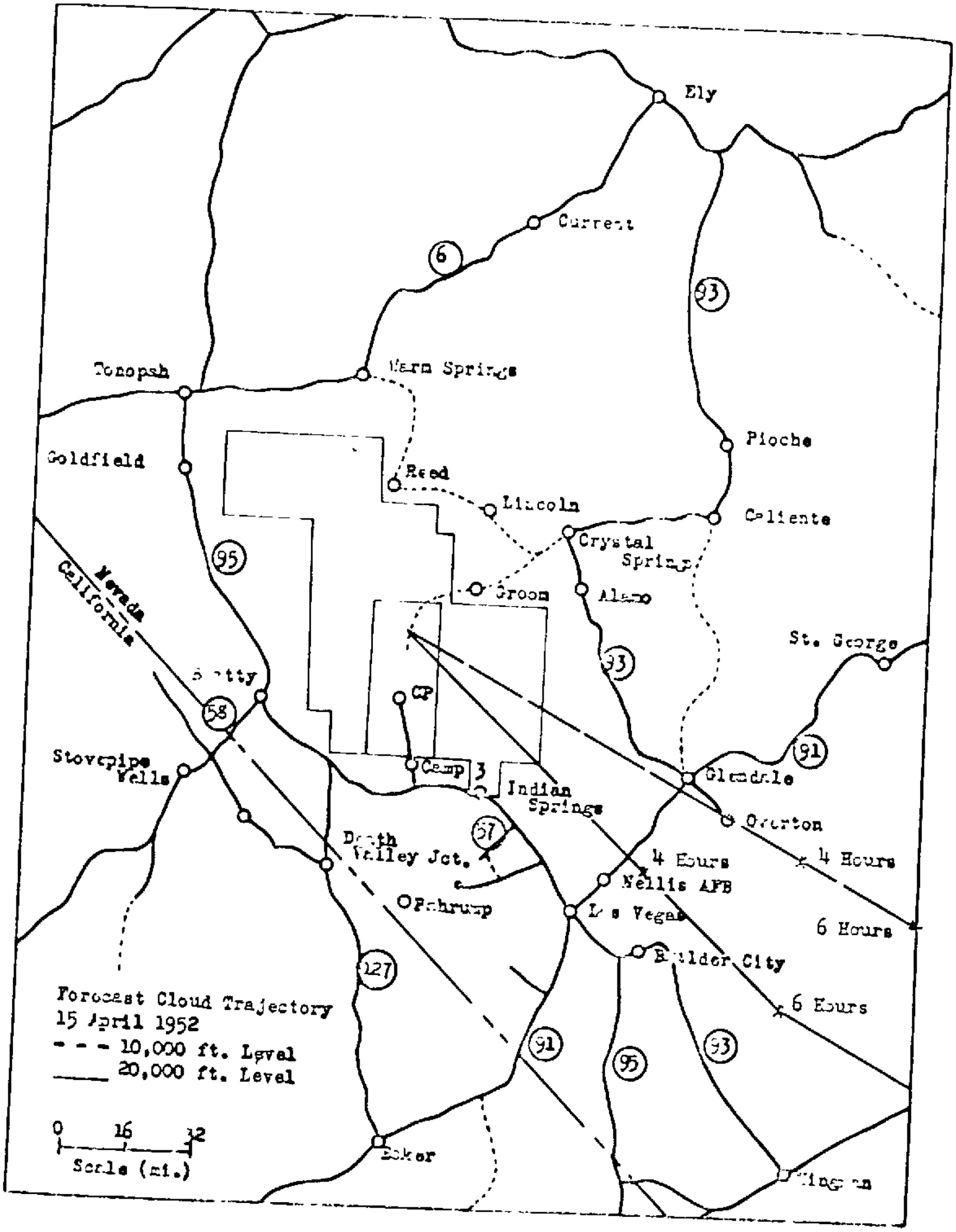


Fig. B.2 Forecast Cloud Trajectory, Shot 2

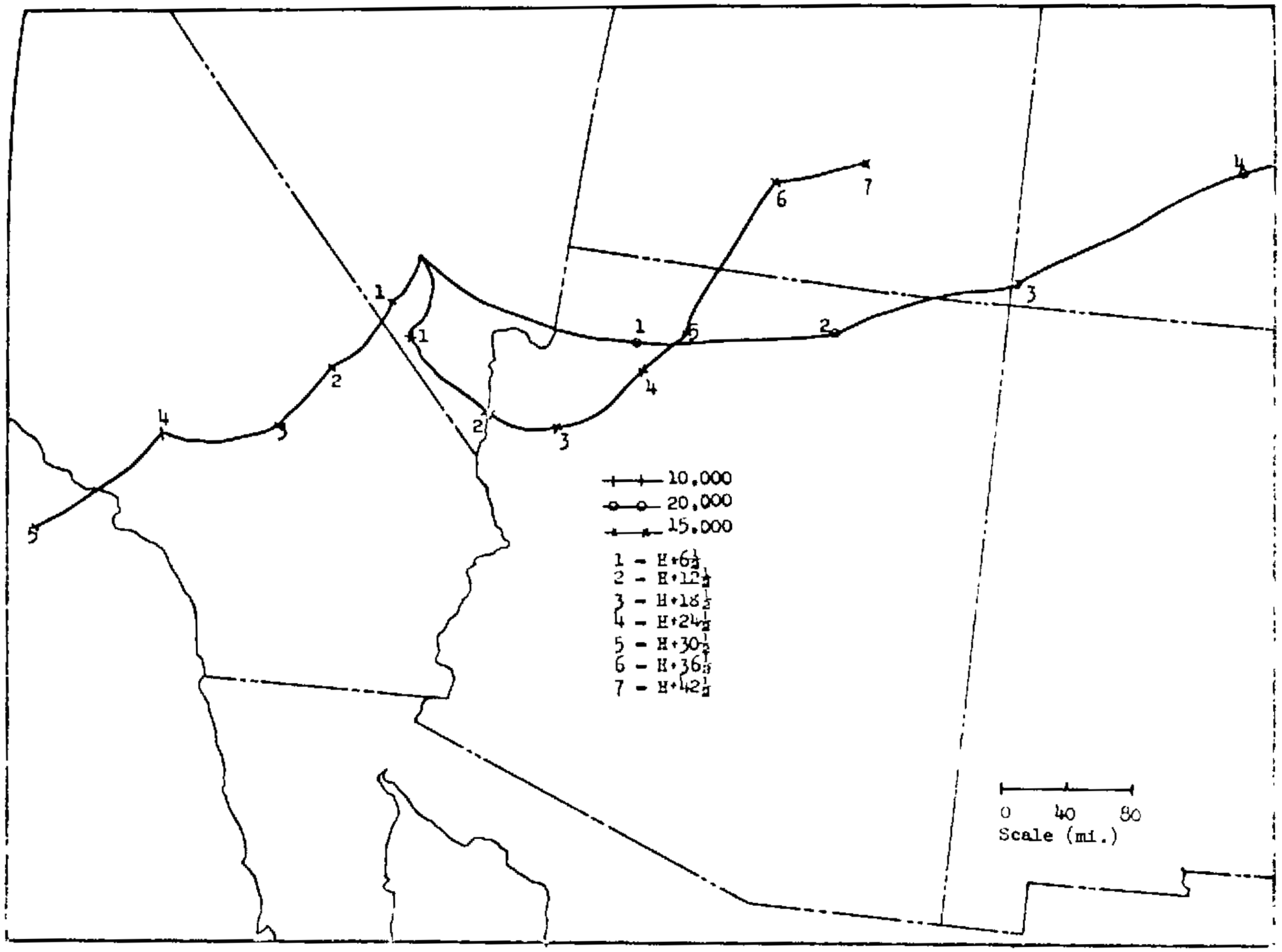


Fig. B.3 Cloud Trajectory, Shot 2

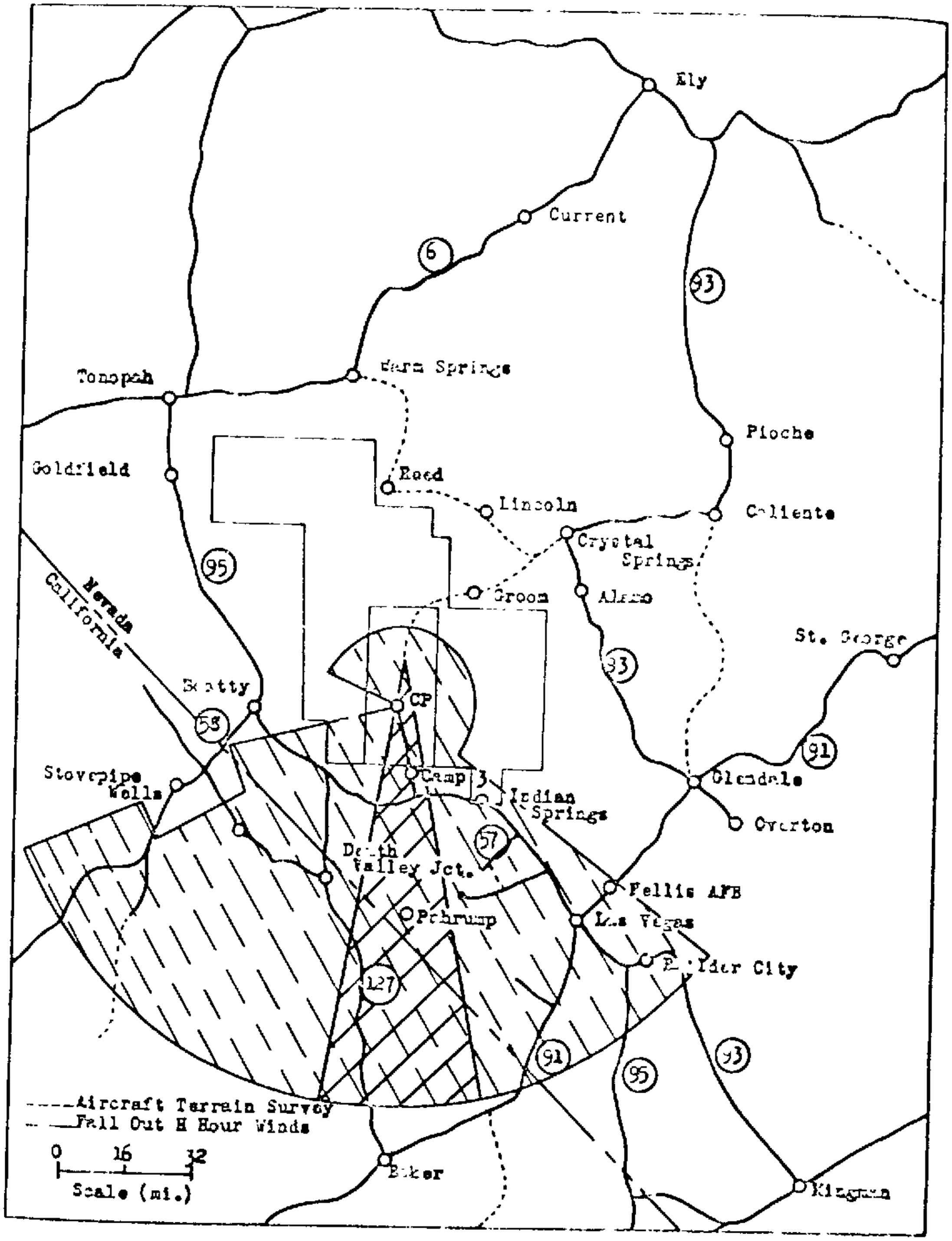


Fig. B.4 Fall-out Forecast and Area Covered by Surveys, Shot 2

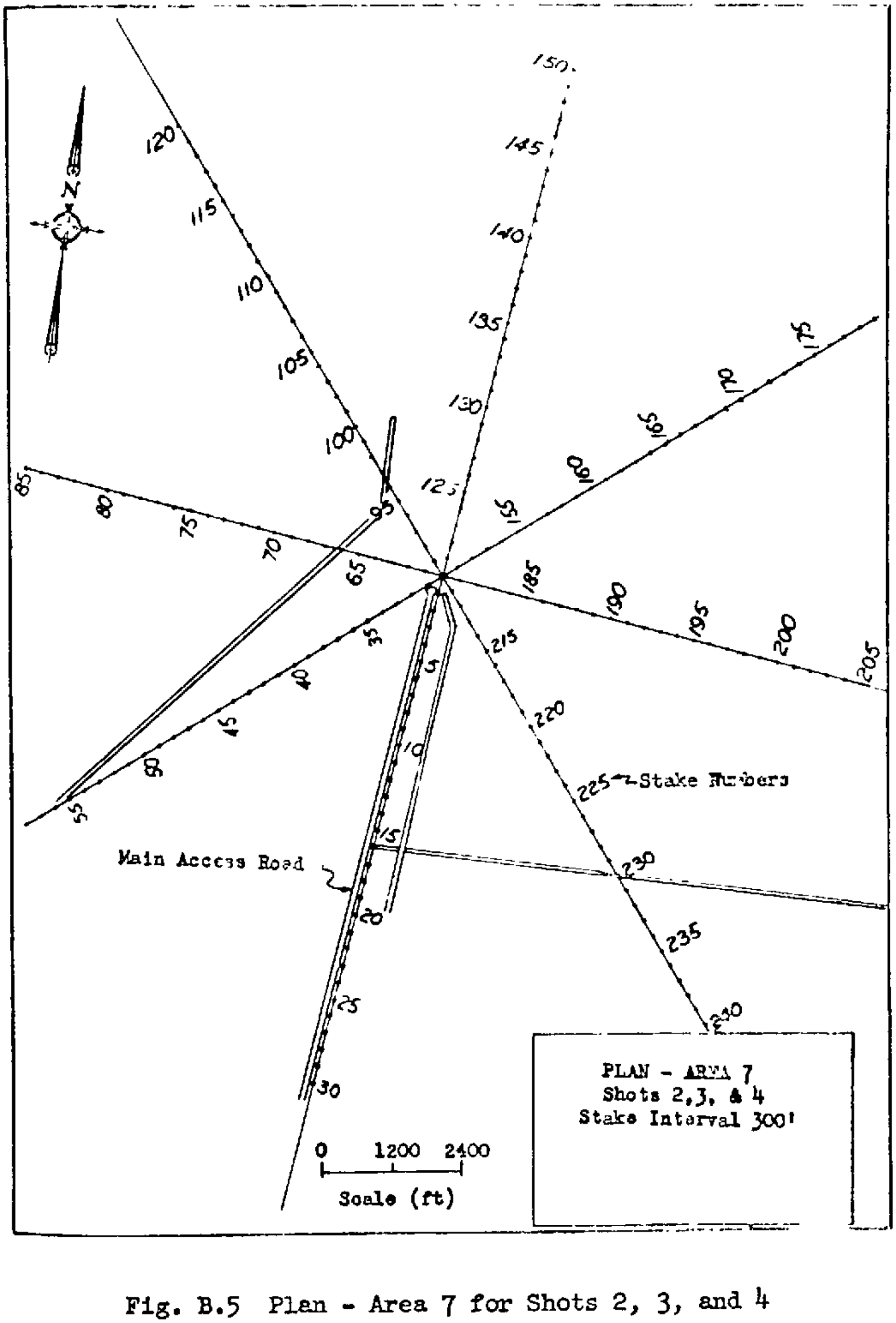


Fig. B.5 Plan - Area 7 for Shots 2, 3, and 4

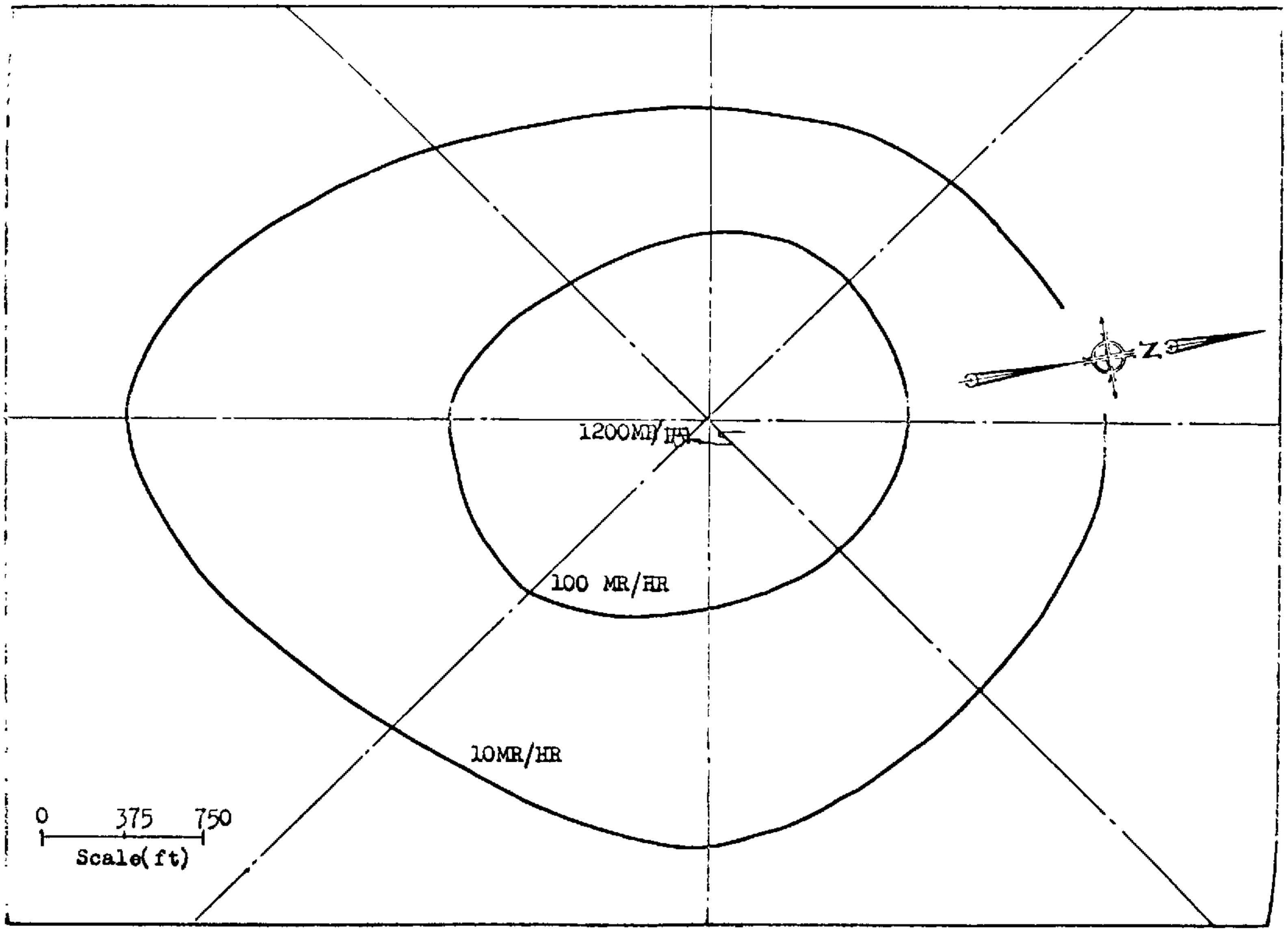


Fig. B.6 Isointensity Overlay, 1011-1040, Shot 2

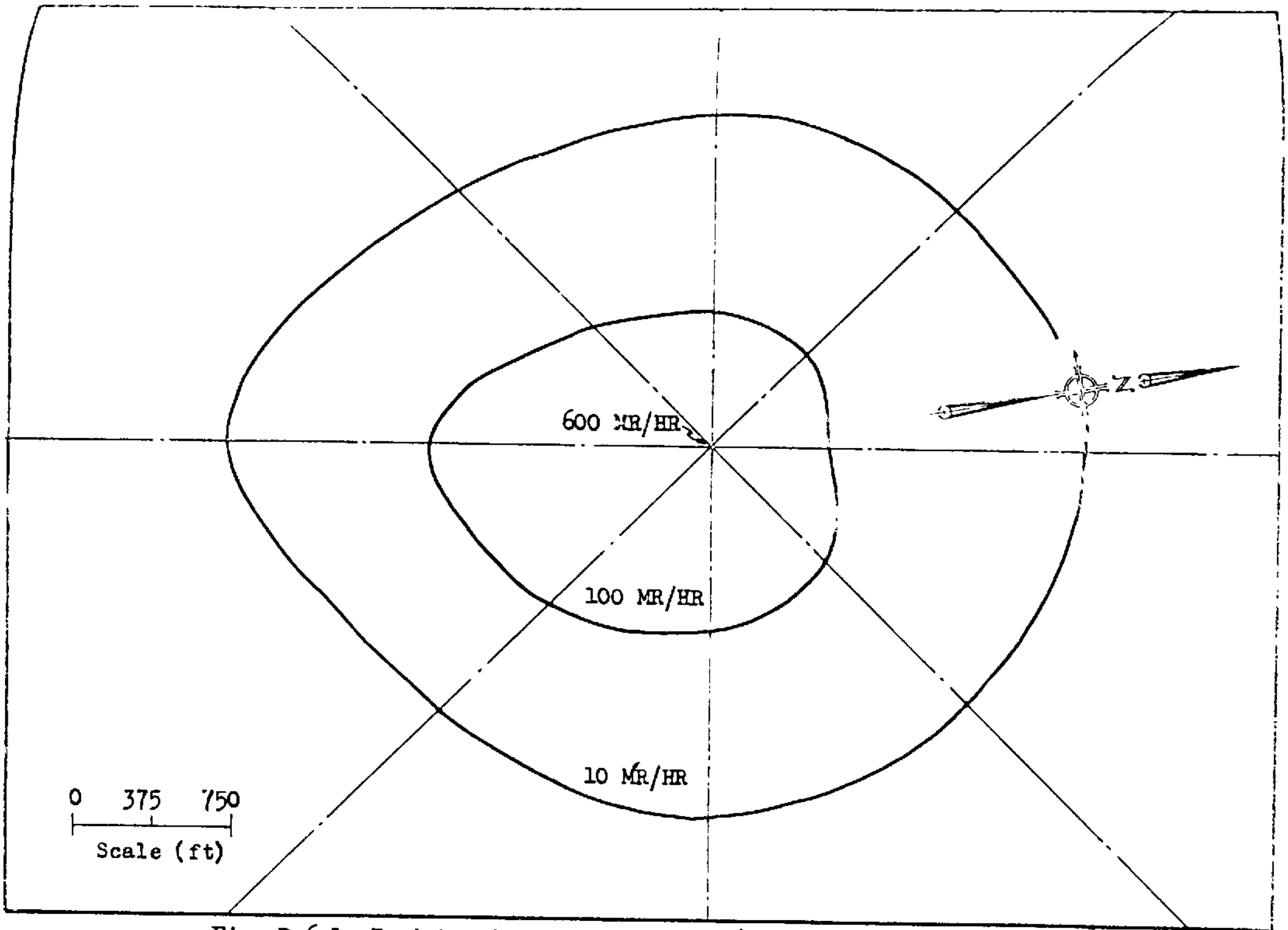


Fig. B.6.1 Isointensity Overlay, 1300-1400 PST, Shot 2 (See Fig. B.5)

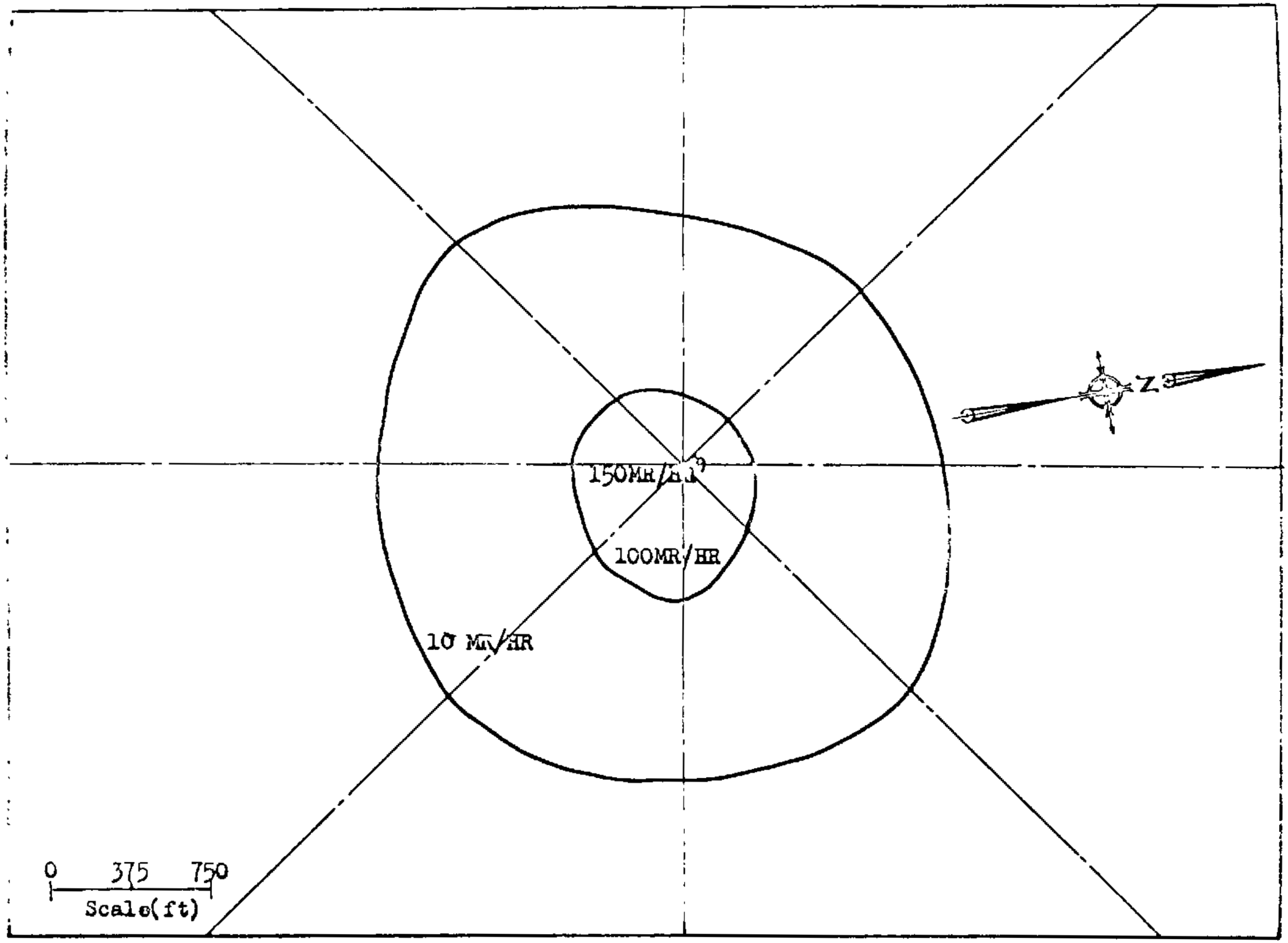


Fig. B.6.2 Isointensity Overlay, 0700, Shot 2 (See Fig. B.5)

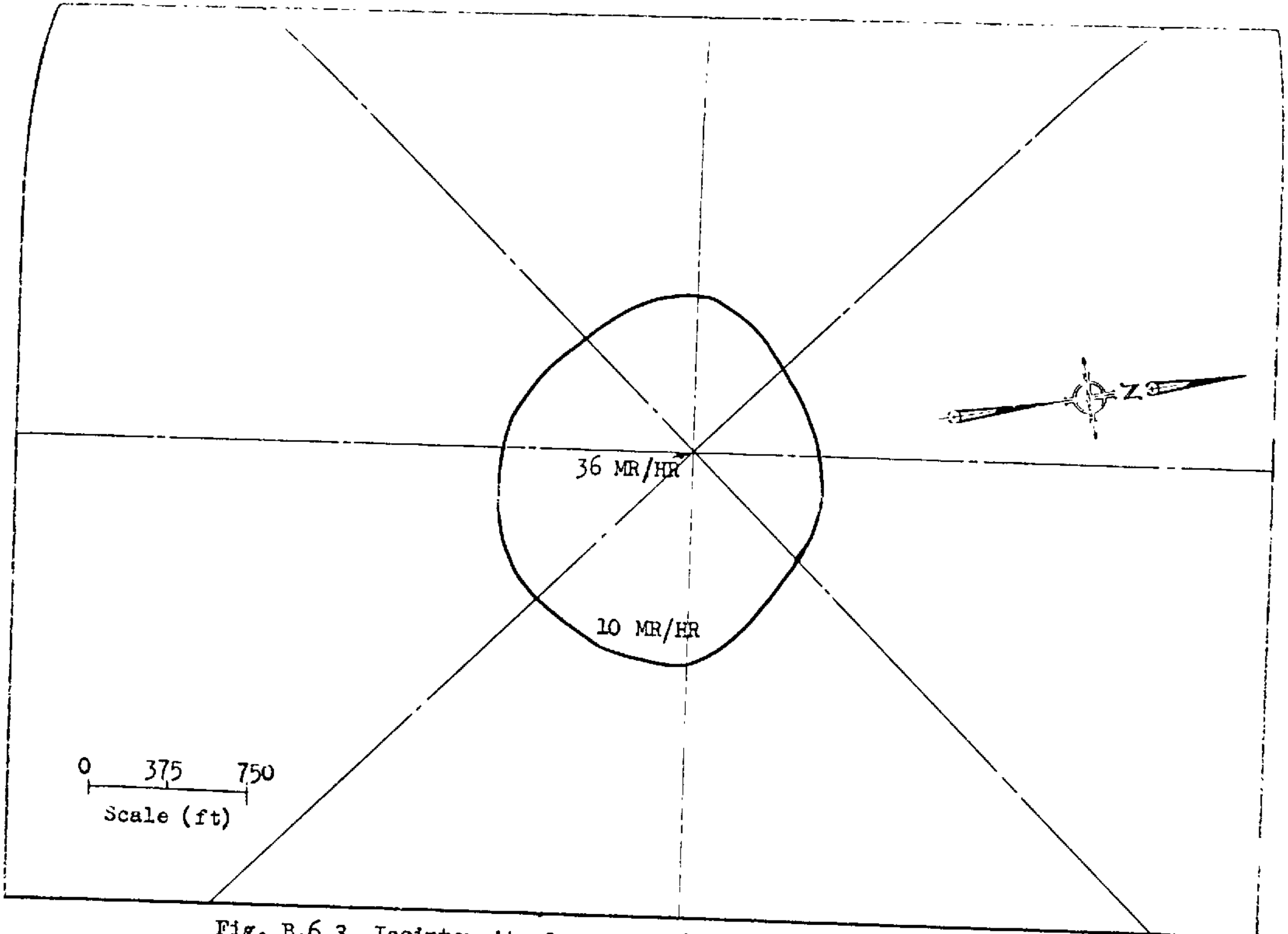


Fig. B.6.3 Isointensity Overlay, 0630, Shot 2 (See Fig. B.5)

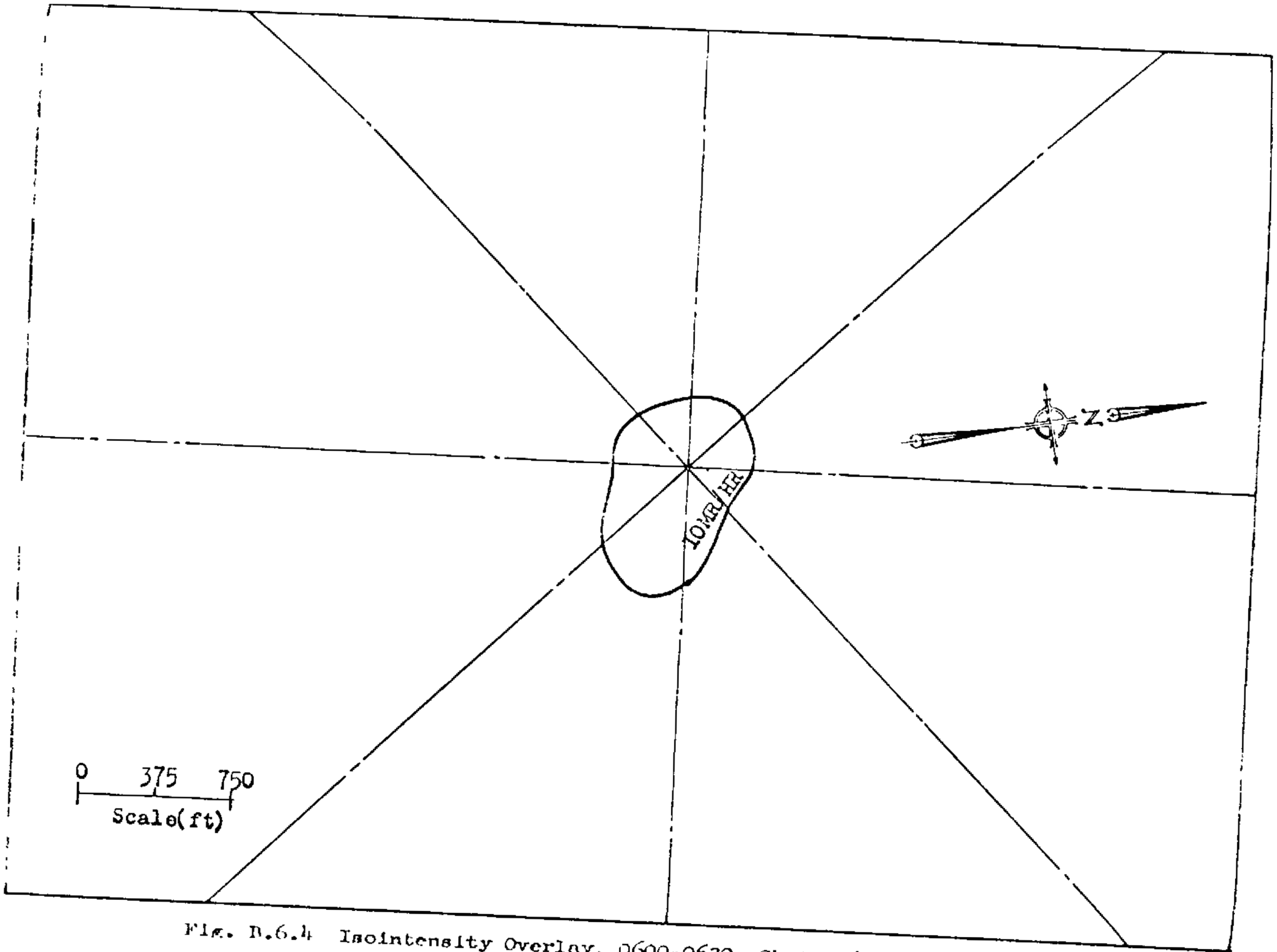


Fig. B.6.4 Isointensity Overlay, 0600-0632, Shot 2 (See Fig. B.5)

TABLE B.6

Monitors' Survey Report - Shot 2 - 15 April 1952

Stake No.	INTENSITY 15 April 52 Mr/Hr	15 April 52 Time	15 April 52 Mr/Hr	15 April 52 Time	16 April 52 Mr/Hr	16 April 52 Time	17 April 52 Mr/Hr	17 April 52 Time	18 April 52 Mr/Hr	18 April 52 Time
GZ	240	1010		.	135		36	0606	16	0622
1	1200	1022	410	1325	136		36	0606	14	0620
2					80		36	0605	16	0619
3	260	1020	190	1324	38		20	0604	4.5	0615
4	100	1018	140	1321	18		10	0602	2.3	0614
5	40	1017	34	1320	8		5	0601	1	0611
6	27	1016	24	1319	5.5				.3	06[illegible]
7	18	1016	16	1317	2.6					
8	13	1015	5	1315	1.4					
9	11	1014	2.6	1314	1					
10	8	1013	1.8	1313						
11	7	1012	2.4	1312						
12	8	1010	1.7	1312						
13	8	1010	1.6	1311						
14	8	1009	1.4	1310						
15	7	1008	1.4	1309		0620 to 0700				
16	5	1004	1	1308						
17	5	1004	.1	1308						
18	5	1002	.3	1306						
31	300	1022	240	1416	120		26	0618	10	0620
32	100	1023	140	1415	80		13	0619	6	0621
33	98	1024	70	1414	30		6	0620	4	0622
34	40	1025	32	1413	15				2	0620
35	20	1026	17	1412	10				1	0624
36	12	1035	8	1411	7					
37	[illegible]	1035	5	1410	3					
38	3.2	1036	2.5	1410	2					
39	1	1038	1.3	1409	1					
40	0	1039	.6	1408	.5					

TABLE B.6 (Cont'd.)

Stake No.	INTENSITY									
	15 April 52		15 April 52		16 April 52		17 April 52		18 April 52	
	Mr/Hr	Time	Mr/Hr	Time	Mr/Hr	Time	Mr/Hr	Time	Mr/Hr	Time
41	0	1040	.2	1408						
42	0	1041	.2	1407						
43	0	1042	0	1406						
44	0	1043	0	1405						
45	0	1044	6	1404						
46	0	1045	0	1403						
47	0	1045	0	1402						
48	0	1046	0	1400						
61	160	1023	220	1334	100		24	0611	8	0630
62	96	1024	100	1335	42		13	0612	6	0631
63	50	1025	43	1336	20		6	0613	4	0632
64	35	1026	37	1337	10				2	0633
65	12	1027	12	1338	4				1	0644
66	6	1028	7	1340	3					
67	5	1029	4	1341	2					
68	4	1030	2	1342	1					
69	4	1031	1.5	1343						
70	4	1032	.6	1344						
71	4	1033	.4	1345						
72	3	1034	0	1346						
73	3	1035	0	1347						
74	3	1036	0	1348						
75	3	1037	0	1349						
76	3	1038	0	1340						
77	3	1039	0	1341						
78	3	1040	0	1342						
91	44	1016	220	1333	18		24	0547	10	0645
92	82	1017	102	1332	38		10	0546	6	0631
93	165	1010	50	1332	100		5	0545	3	0636
94	21	1015	24	1330	8				1	0634

TABLE B.6 (Cont'd)

Stake No.	INTENSITY 15 April 52 Mr/Hr	Time	15 April 52 Mr/Hr	Time	16 April 52 Mr/Hr	Time	17 April 52 Mr/Hr	Time	18 April 52 Mr/Hr	Time
95	11	1013	12	1325	4.2	0620 to 0700			.4	0322
96	8	1017	6	1324	2.4					
97	6	1011	4.4	1323	1.4					
98	5	1010	3.2	1322	1.8					
99	4	1009	2.2	1320	1					
100	4	1008	1.6	1320						
101	4	1007	1	1319						
102	4	1006	.8	1312						
103	4	1005	.8	1317						
104	4	1004	0	1316						
105	4	1003	0	1316						
106	2	1002	0	1315						
107	4	1001	0	1315						
108	4	1000	0	1315						
121	340	1030	220	1339	100		20	0608	12	0623
122	170	1031	90	1340	60		10	0610	10	0626
123	70	1032	70	1340	20		5	0612	7	0628
124	50	1033	40	1343	10				5	0629
125	30	1034	20	1345	5				4	0630
126	10	1036	8	1347	2.4					
127	7	1037	5	1348	1.2					
128	4	1038	2	1349	.8					
129	2	1039	2	1350						
130	1.5	1040	.8	1353						
131	1	1041	.4	1355						
132	1	1042	.2	1356						
133	.5	1043	.2	1357						
134	.5	1044	.1	1358						
135	.5	1045	.1	1359						
136	.5	1046	.1	1400						
137	.5	1047	.1	1400						

TABLE B.6 (Cont'd.)

Stake No.	INTENSITY									
	15 April 52		15 April 52		16 April 52		17 April 52		18 April 52	
	Mr/Hr	Time	Mr/Hr	Time	Mr/Hr	Time	Mr/Hr	Time	Mr/Hr	Time
138	.5	1048	.1	1401						
151	370	1028	240	1336	130	0620 to 0700	26	0616	10	0615
152	220	1027	130	1335	90		14	0612	6	0614
153	110	1026	70	1334	30		7	0614	4	0613
154	40	1025	33	1333	17				2	0612
155	27	1024	76	1332	10				1	0611
156	16	1023	8	1331	4				.5	0610
157	9	1022	3	1329	2					
158	5.5	1020	2.7	1328	1.5					
159	3.5	1019	1.5	1326	1					
160	2.5	1018	.8	1324	.5					
161	2	1017	.6	1321						
162	2	1016	.4	1320						
163	2	1015	.3	1320						
164	2.1	1014	.1	1320						
165	2	1013	.1	1319						
166	2	1012	.1	1318						
167	1	1011	.1	1317						
168	1	1010	.1	1316						
181	400	1022	350	1328	145		36	0604	14	0600
182	280	1021	240	1327	105		24	0603	10	0601
183	110	1020	100	1326	60		14	0601	6	0602
184	52	1017	40	1325	20		5	0600	4	0603
185	31	1016	15	1324	10				1	0604
186	17	1015	10	1320	5					
187	10	1013	8	1319	3					
188	5	1012	3	1318	2					
189	5	1012	2	1317	1					
190	4	1011			.5					
191	3	1010								
192	3	1009								

TABLE B.6 (Cont'd.)

Stake No.	INTENSITY									
	15 April 52		15 April 52		16 April 52		17 April 52		18 April 52	
	Mr/Hr	Time	Mr/Hr	Time	Mr/Hr	Time	Mr/Hr	Time	Mr/Hr	Time
19[illegible]	2	1008								
201	330	1021	240	1324	60	0620 to 0700	13	0603		
202	40	1017	134	1320	8		5	0555		
203	.15	1015	12	1315	1.8		2	0557		
204	18	1013	1.8	1312			.3	0600		
205	8	1007	1.6	1310						
206	5	1005	1.4	1309						
207	5	1002	.1	1307						
208	4	1001	.6	1305						
209	.6	0959	.4	1304						
210	1	0958	.4	1307						
211	420	1023	380	1330	140		34	0550	14	0657
212	320	1024	240	1331	100		24	0551	10	0652
213	100	1025	160	1332	60		12	0552	6	0654
214	100	1026	90	1333	24		8	0553	3	0655
215	40	1027	40	1334	12		5	0555	1.2	0656
216	25	1028	10	1335	6				.5	0653
217	10	1030	4	1340	3.2					
218	5	1031	3	1341	1.8					
219	3	1032	2	1342	1					
220	2	1033			.6					
221	1.5	1034								

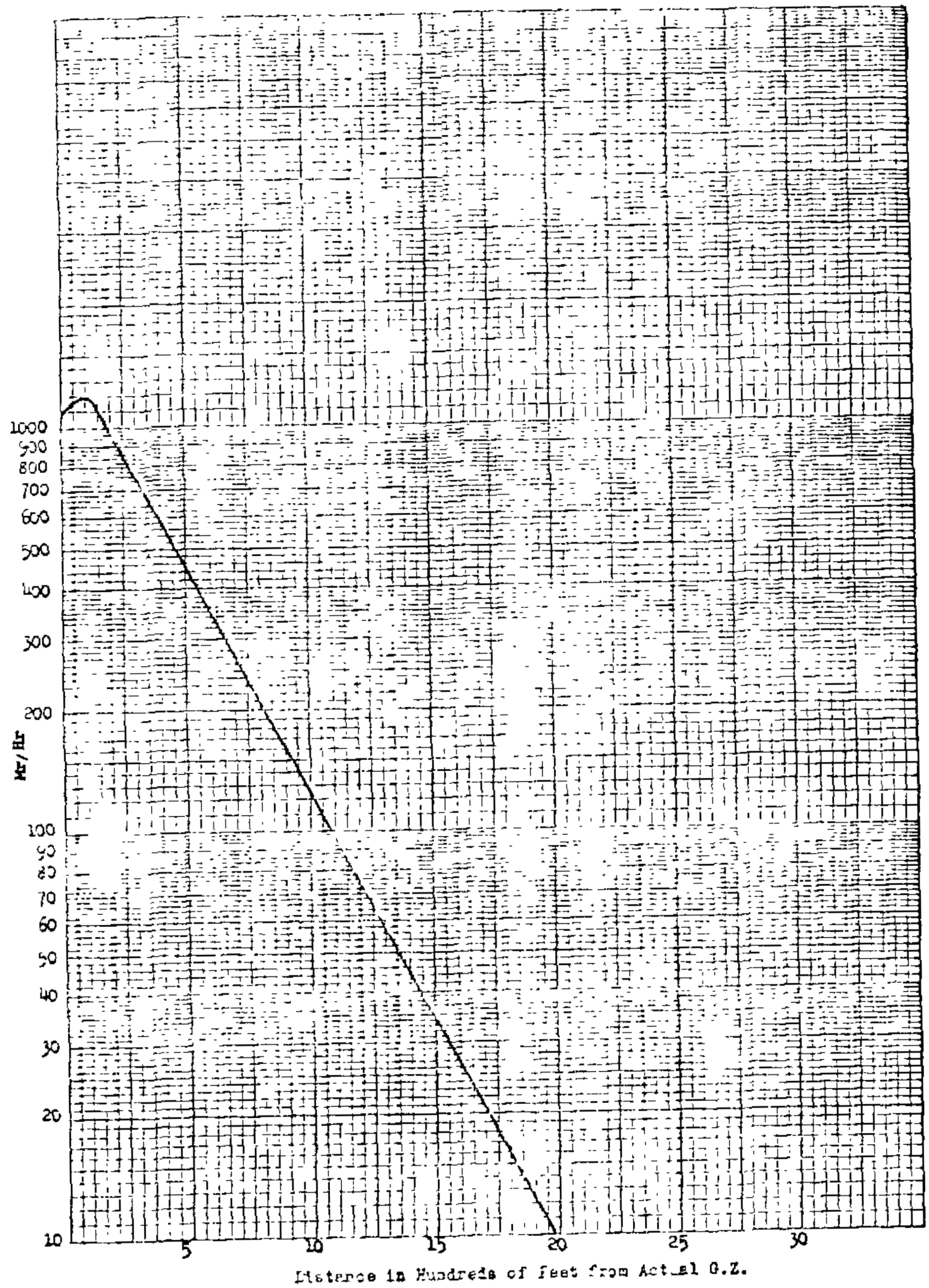


Fig. B.7 Ground Contamination (mr/hr) vs Distance from Ground Zero, Shot 2, H +1 hr Readings

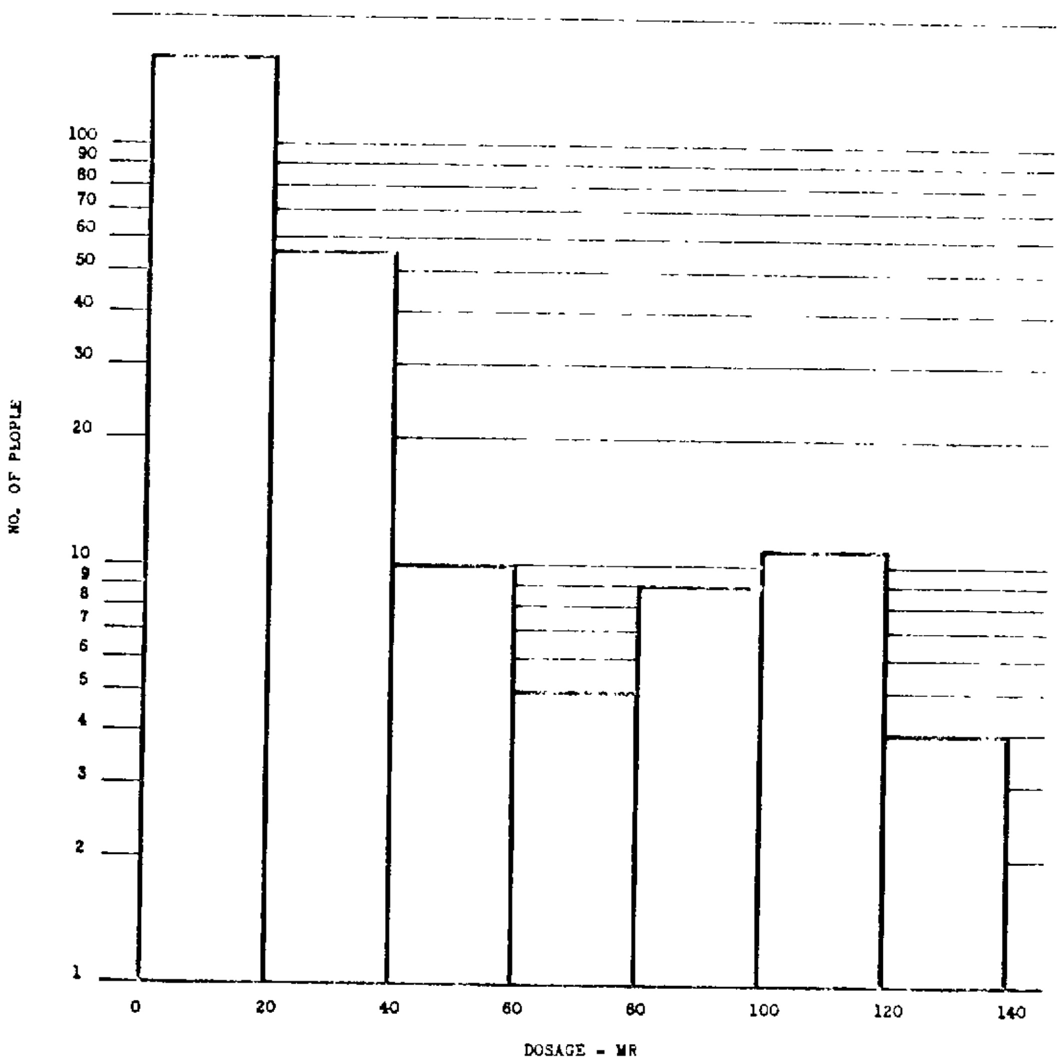


Fig. B.8 Accumulated Dose Report, Shot 2 (For Personnel Issued Film Badges During Period B to C-1 Days).

APPENDIX C

OPERATION TUMBLER-SNAPPER

Shot 3 - 22 April 1952
(Period Covered - 22 April-30 April)

OPERATIONAL DATA

Location: Area 7 - Sta. 3
Height of Burst: 3447 ft.
Yield (KT): 30
Time Fired: 0930 (PST)

OPERATION TUMBLER-SNAPPER
Shot 3 - 22 April 1952

C.1 OFF-SITE OPERATIONS DEPARTMENT

By the time the third shot was fired, all personnel of the Off-Site Operations Department were thoroughly familiar with their assigned duties, and practically no changes in procedure were necessary during this period of operations. Although the yield of this weapon (30 KT) was considerably higher than those of the previous two air shots, there was no apparent mixing of the column of dirt that arose after the detonation with the fireball and cloud. The levels of contamination found in off-site areas were very low, with the highest ground reading reported as .2 mr/hr. A very large area was surveyed as indicated by the fall-out plot. The data obtained by the Off-Site Department for this shot are shown in Tables C.1 through C.5 and Figures C.1 through C.3.

C.2 MATERIEL AND LOGISTICS DEPARTMENT

For this shot 435 suits of protective clothing, 90 MX-5 radiac instruments, and approximately 160 T1B's were issued. Although no important changes in procedure were necessary before or after this shot in the Materiel and Logistics Department, improvement of facilities continued throughout the operation. Permanent signs were ordered to replace the temporary ones. Additional bins were made for the storage of supplies. As an emergency measure, 55-gallon drums and gas were procured and stored at Lincoln and Groom Mines for the mobile monitors. A forward Motor Dispatch Section and a "hot" parking area were established at the CP by the Director of Materiel and Logistics Department on 23 April 1952. This section was established to control vehicles not decontaminated below tolerance levels, and to afford a parking space for

vehicles not returning to Camp Mercury each night. This procedure reduced the mileage and gas, oil and repair costs for these vehicles. The provision of a parking area where vehicles could await natural decay eliminated the high cost of maintaining the steam gun to decontaminate these vehicles to safe operational levels of intensity. A "vehicle monitor" was received from Los Alamos 25 April and installed at Guard Post No. 2, located just above Mercury on the main highway leading to the CP. This monitor consisted of 2 Geiger-Mueller tubes arranged with one on each side of the road, so that any vehicles contaminated above tolerance levels would automatically trigger the circuit and ring an electric bell. This was an excellent strategem. After the first few vehicles had been "trapped" and returned to the Vehicle Decontamination Station, a conspicuous increase was noted in the number of drivers voluntarily reporting there for decontamination. Furthermore, there was a marked decrease in the number of contaminated vehicles found in the Mercury area after this vehicle monitor was placed in operation. Improved communications with the off-site vehicles were effected by installing an additional transmitter and receiver in the C-47 relay aircraft, enabling it to transmit and receive on both 164 megacycles and 167 megacycles. In this manner, the C-47 aircraft worked from the mobile vehicles through Spring Mountain Relay Station to the CP.

C.3 ON-SITE OPERATIONS DEPARTMENT

The T-7 area of Yucca Flat, which served as a target area for Shot 2, was also utilized as target area for Shots 3 and 4, and the intensity readings were made at the same stake positions as for the previous shot. This weapon was detonated at approximately 3450 feet, and the level of residual contamination on the ground was very low, reaching a maximum of 100mr/hr, with the average readings in the vicinity of ground zero being 90mr/hr. The Test Director's Operation Order #1-52, Annex C scheduled 18 programs and 75 projects for participation in technical test activities for this shot. No difficulties were encountered by the On-Site Operations Department in carrying out the schedule. The data obtained is presented in Table C.6, and Figures C.4 through C.8.

TABLE C.1

Ground Mobile Monitors' Report - Shot 3 - 22 April 1952. (See Fig. A.1) (Normal background: .02 - .04 mr/hr).

TIME	READING Mr/Hr	GRID LOCATION (Ref.Fig. A.1)	LOCATION IN DETAIL	REMARKS
0925	.03	D6 ul.5	Baker, Calif.	
1000	.02	D4.5 U4	Between Baker & Shoshone, Calif.	
1030	.01-.03	D5 TO	Shoshone, Calif.	
1110	.01-.03	D5 TO	Shoshone, Calif.	
1230	.01-.04	D6 T1	Nev52 to Pahrump	
1230	.02	E2 T3	Indian Spgs.	
1235	.02	E2 T3	2 mi. W. of Indian Spgs.	
1250	.02	E1 T3	10 mi. W. of Indian Spgs.	
1250	.02	E0 T3	Jct. of Hwy.95 & Rd. to Mercury	
1305	.02	D5 T3	30 mi. W. of Indian Spgs.	C-47 Communica-
1305	.02	E0 T3	10 mi. N. W. of Indian Spgs.	tions plane
1310	.02	E1 T3	13 mi. E. of Mercury on US95	came into Ser-
1310	.01-.06	D6 T2	Halfway Bet. Pahrump & US95 on Nev16	vice
1315	.02	E2 T3	Indian Spgs.	
1320	.02	E2 T3	21 mi. E. of Mercury	
1320	.02	D4 T3	16 mi. E. of Lathrop Wells	
1324	.01-.04	E0 T2	10 mi. N. of Pahrump on Nev16	
1325	.02	E3 T3	10 mi. SE of Indian Spgs.	
1330	.02	D3 T4	Lathrop Wells	
1330	.02	E3 T3	27 mi. E. of Mercury on US 95	
1335	.02	E3 T2	16 mi. SE of Indian Spgs.	
1335	.02	E3 T2	31 Mi. E. of Mercury on US 95	
1340	.02	E3 T2	2 mi. from US 95 on Nev52	
1345	.02	D4 T3	18 mi. E. of Lathrop Wells	
1350	.02	E2 T2	6 mi. from US 95 on Nev52	Occasionally
1354	.01-.03		Jct. US 95 & Nev16	.05 mr/hr
1355	.02	D5 T3	27 mi. W. of Indian Spgs.	
1355	.02	E4 T1	Jct. US 95 & Nev 39	
1400	.02	C5 RO	6 mi. E. of Tonopah (Tonopah Airport)	
1400	.02	E2 T2	10 mi. from US 95 on Nev 52	
1400	.03	E0 T4	Camp #3	
1405	.02	E3 T1	10 Mi. W. of US 95 on Nev 39	
1410	.02	C5 RO	Tonopah Airport	
1410	.03-.06	E2 T2	13 mi. from US 95 on Nev 52	
1410	.02	E2 T3	Indian Spgs.	
1415	.06	E0 T3	21 mi. W. of Indian Spgs.	
1415	.02	C5 RO	Tonopah Airport	
1415	.02	E2 T1	20 mi. from US 95 on Nev 39	
1420	.03-.05	E1 T2	15 mi. from US 95 on Nev 52	Occasionally
1420	.04	E3 T2	E. of Indian Spgs.	0.1 mr/hr

TABLE C.1
(Cont'd.)

TIME	READING Mr/Hr	GRID LOCATION (Ref. Fig. A.1)	LOCATION IN DETAIL	REMARKS
1425	.03	E2 T1	28 mi. W. of US 95 on Nev39	
1430	.05	D5 T3	20 mi. E. of Lathrop Wells	
1430	.03	E1 T2	15 mi. from US 95 on Nev 52	
1430	.03-.07-.1	E1T3	On US 95	
1430	.03	E3 T2	E. of Indian Spgs. on US 95	
1435	.03	E3 T1	18 mi. W. of US 95 on Nev 39	
1440	.03-.05	E2 T2	14 mi. from US 95 on Nev 52	Area Approx. 5 mi.
1440	.05-.1	E4 T1	From Las Vegas on US 95	in lgth.
1445	.02	E4 T1	Jct. US 95 & Nev 39	
1445	.04	D5 T3	15. mi. E. of Lathrop Wells	
1450	.03	E2 T2	12 mi. from US 95 on Nev 52	
1450	.03	E5 T1	Las Vegas	
1455	.03	E2 T2	11 mi. from US 95 on Nev 52	
1455	.03	E3 T3	Jct. US 95 & Nev 52	
1455	.02	E4 T2	8 mi. NW of US 95 on Nev 39	
1500	.09	E0 T3	25 mi. W. of Indian Spgs.	
1500	.03	E5 T1	Las Vegas	
1505	.02	E3 T2	Jct. US 95 & Nev 52	
1505	.02	E2 T2	8 mi. from US 95 on Nev 52	
1510	.13	E1 T3	10 mi. W. of Indian Spgs.	
1510	.03	E4 T2	Jct. US 95 & Nev 39	
1510	.13	E1 T3	10 mi W. of Indian Spgs.	
1510	.03	E4 T2	Jct. US 95 & Nev 39	
1510	.02	E5 T1	5 mi. N. of Las Vegas on US 91/93	
1512	.03-.07	E4 T2	$1\frac{1}{2}$ mi. from US 95 on Nev 39	
1515	.03-.05	E4 T2	2 mi. from US 95 on Nev 39	
1515	.02	E2 T2	1 mi. from US 95 on Nev 52	
1515	.02	E2 T3	9 mi. NW of US 95/52 on US 95	
1520	.10	E1 T3	5 mi. W. of Indian Spgs.	
1520	.02	E3 T2	Jct. US 95 & Nev 52	
1520	.02	F0 T2	Las Vegas to Glendale, 10 mi. N. of Las Vegas on US 91/93	
1525	.05	E2 T3	Indian Spgs.	
1525	.04	E3 T2	9 mi. from US 95/39 Jct.	
1530	.02	E3 T2	1.2 mi. from US 95 on Nev 52	
1530	.01	F0 T2	20 mi. N. from Las Vegas	
1535	.03	E3 T2	9 mi. from US 95/39 Jct.	
1535	.02	E2 T3	1 mi. SE of Indian Spgs.	
1535	.18	E2 T3	Indian Spgs.	
1540	.02	F1 T3	30 mi. N. from Las Vegas on US 91/93	
1545	.02	E2 T2	5 mi. from US 95 on Nev 52	
1545	.15	E0 T3	27 mi. W. of Indian Spgs.	

TABLE C.1
(Cont'd.)

TIME	READING Mr/Hr	GRID LOCATION (Ref.Fig. A.1)	LOCATION IN DETAIL	REMARKS
1545	.03	E3 T3	6 mi. SE of Indian Spgs.	
1545	.01	F1 T3	40 mi. N. from Las Vegas on US 91/93	
1550	.03	E3 T2	9 mi. from 95/39 Jct.	
1550	.02	E2 T2	6 mi. from US 95 on Nev 52	
1555	.02	E2 T2	8 mi. from US 95 on Nev 52	
1555	.02	E0 T3	27 mi. W. of Indian Spgs.	
1555	.03-.05	E3 T3	12 mi. SE of Indian Spgs. on US 95	
1555	.02	F2 T4	Glendale Jct. Nev.	
1600	.04	E2 T2	9 mi. from US 95 on U S 52	Radio Reception
1600	.2	D5 T3	20 mi. E. of Lathrop Wells	very Spotty
1605	.05	E4 T2	12 mi. SE of Nev 52 on US 95	
1605	.2	D5 T3	15 mi. E. of Lathrop Wells	Contaminated in--
1610	.03-.05	E2 T2	12 mi. from US 95 on Nev 52	strument Radio
1610	.01	F1 T3	40 mi. N from Las Vegas on US 91/93	Reception Very Spotty
1610	.2	D5 T3	10 mi. E. of Lathrop Wells	Contaminated in-
1615	.03-.05	E3 T2	7 mi. E. of US 95 on Nev 52	strument
1615	.2	D5 T3	10 mi. E. of Lathrop Wells	
1615	.01	F1 T3	30 mi. N. from Las Vegas on US 91/93	
1620	.04	E2 T2	13 mi. from US 95 on Nev 52	
1620	.01	F1 T3	20 mi. N. from Las Vegas on US 91/93	
1620	.2	E0 T3	25 mi. E. of Lathrop Wells	Contaminated instrs.
1625	.04	E3 T2	Jct. Nev 52 & US 95	
1625	.04	E2 T3	Indian Spgs.	
1625	.2.	E1 T3	5 mi. W. of Indian Spgs.	Contaminated instrs.
1630	.05	E2 T2	13 mi. from US 95 on Nev 52	
1630	.01	F1 T3	10 mi. N. from Las Vegas on US 91/93	
1630	.3	E2 T3	Indian Spgs.	Contaminated instruments
1640	.05	E1 T3	15 mi. from US 95 on Nev 52	
1640	.01	F0 T2	5 mi. N. from Las Vegas on US 91/93	
1645	.15	E1 T3	4 mi. W. Indian Spgs. on US 95	
1650	.02	E5 T1	Las Vegas	
1650	.06	E2 T2	13 mi. from US 95 on Nev 52	
1655	.17	E0 T3	15 mi. W. of Indian Spgs. on US 95	
1700	.02	E5 T1	Las Vegas	
1700	.03	E2 T2	9 mi. from US 95 on Nev 52	
1705	.02	E2 T2	7 mi. from US 95 on Nev. 52	
1710	.02	E2 T2	5 mi. from US 95 on Nev 52	
1715	.02	E3 T2	3 mi. from US 95 on Nev 52	
1725	.02	E2 T2	30 mi. E. of Mercury on US 95	
1730	.03	E2 T3	27 mi. E. of Mercury on US 95	

TABLE C.1
(Cont'd.)

TIME	READING Mr/Hr	GRID LOCATION (Ref.Fig. A.1)	LOCATION IN DETAIL	REMARKS
1735	.02	E3 T3	23 mi. E of Mercury on US 95	
1740	.05	E2 T3	19 mi. E. of Mercury on US 95	
1745	.1	E2 T2	17 mi. E. of Mercury on US 95	Varied bet. 0.1
1750	.2	E1 T3	14 mi. E. of Mercury on US 95	&0.2 from this
1755	.1	E1 T3	10 mi. E. of Mercury on US 95	pt. to Mer.
1800	.2	E0 T2	8 mi. E. of Mercury on US 95	Varied bet. 0.1 &
1805	.15	E0 T3	4 mi. E. of Mercury on US 95	0.2
1810	.1	E0 T3	9/10 mi. E. of Mercury US 95	Varied bet. 0.1 &
1815	.1	E0 T3	Jct. US 95 & Mercury	0.2
1830	.03	E4 T1	Las Vegas	
1845	.02	E4 T1	Las Vegas	
1900	.01	E4 T1	Las Vegas	
2045	.03	E4 T1	Las Vegas	
2400	.02	E4 T1	Las Vegas	

TABLE C.2

Aerial Terrain Survey Report (Badger I and II) - Shot 3 - 22 and 23 April 1952
(See Fig. A.2) (Code: Badger - C-47 aircraft).

Report Number	Grid Position (Ref. Fig. A.2)	Time of Report (PST)	Altitude Absolute (Ft)	B-21 Meter Reading (Millivolts B.G./B.G.Cont.)	Rate Meter Reading (Counts/Min)	Geiger Mueller Reading (Mr/Hr)
BADGER I 22 APRIL						
1	2A4	1312	1000	320/320		.04
2	2C3	1318	500	320/450		.05
3	2C2	1321	1000	320/680		.01
4	2A3	1325	800	320/810		.05
5	2B4	1333	1000	- -		.03
6	2C5	1340	1500	320/320		.02
7	2D5	1344	1500	320/320		.05
8	3C4	1348	500	- -		.03
9	2B3	1352	500	320/320		.04
10	2A2	1356	700	320/320		.03
11	2C1	1405	700	320/1000		.10
12	2A1	1409	1500	320/690		.20
13	2B2	1415	600	350/350		.05
14	2C3	1420	500	330/330		.03
15	2D4	1429	500	310/310		.03
16	2E4	1435	500	310/310		.03
17	2D6	1443	1000	320/320		.03
18	2D7	1447	1000	340/340		.04
19	2D4	1451	500	330/330		.03
20	2D9	1455	800	340/340		.03
21	2D10	1459	1500	340/340		.04
22	2E10	1504	1000	340/340		.02
23	2E9	1509	1000	340/340		.03

TABLE C.2 (Cont'd.)

Report Number	Grid Position (Ref. Fig. A.2)	Time of Report (PST)	Altitude Absolute (Ft)	B-21 Meter Reading (Millivolts B.G./B.G.Cont.)	Rate Meter Reading (Counts/Min)	Geiger Mueller Reading (Mr/Hr)
24	2E8	1511	500	330/330		.02
25	2E7	1515	500	340/340		.04
26	2E6	1519	500	300/300		.03
27	2E5	1523	500	310/310		.03
28	2E4	1527	1000	330/330		.03
29	2D3	1530	500	320/320		.03
30	2C2	1537	500	320/500		.05
31	2B1	1545	200	320/810		.12
32	2B0	1549	1500	320/970		.20
33	2C1	1557	800	320/830		.18
34	2D2	1602	500	320/500		.04
35	2E3	1608	1500	340/340		.03
36	2F4	1615	1000	360/360		.04
37	2F5	1618	1500	380/380		.04
38	2F6	1621	1000	360/360		.03
39	2F7	1625	100	360/360		.04
40	2F8	1628	500	360/360		.03
41	2F9	1632	1500	350/350		.03
42	2F10	1637	500	350/350		.04
43	2G10	1642	500	350/350		.03
44	2G9	1646	1000	330/330		.03
45	2G8	1650	500	330/330		.03
46	2G7	1653	400	330/330		.03
47	2G6	1656	700	350/350		.03
48	2G5	1700	400	330/330		.04
23 APRIL						
1	2F5	0931	1500	250/250		.03
2	2G3	0940	500	280/280		.025
3	2G1	0946	900	270/270		.025

TABLE C.2 (Cont'd.)

Report Number	Grid Position (Ref. Fig. A.2)	Time of Report (PST)	Altitude Absolute (Ft)	B-21 Meter Reading (Millivolts B.G./B.G.Cont.)	Rate Meter Reading (Counts/Min)	Geiger Mueller Reading (Mr/Hr)
4	2G0	0950	1000	270/270		.03
5	3G1	0953	1500	240/240		.035
6	3G3	0959	500	220/220		.025
7	3G4	1003	500	220/220		.025
8	3F5	1007	1000	230/230		.02
9	3E5	1013	1500	230/230		.025
10	3D5	1019	1500	230/230		.02
11	3C5	1024	400	250/250		.02
12	3B7	1032	800	240/240		.02
13	3B8	1035	500	260/260		.025
14	3C8	1045	1000	250/250		.025
15	4B6	1055	500	300/300		.025
16	4D8	1108	400	300/300		.03
17	4F6	1118	600	290/290		.025
18	4G5	1126	1000	270/270		.03
19	4G3	1133	1000	280/280		.03
20	4G1	1139	800	290/290		.25
21	1G1	1144	700	300/300		.03
22	1G3	1153	1500	290/290		.035
23	105	1200	500	290/290		.025
24	1C7	1215	1000	280/280		.02
25	109	1222	400	280/280		.03
26	1B9	1225	500	260/260		.025
27	109	1232	1000	270/270		.03
28	2B8	1241	1000	260/260		.03
29	2D6	1253	700	260/260		.025
30	2E5	1259	1500	250/250		.025

TABLE C.2 (Cont'd.)

Report Number	Grid Position (Ref. Fig. A.2)	Time of Report (PST)	Altitude Absolute (Ft)	B-21 Meter Reading (Millivolts B.G./B.G.Cont.)	Rate Meter Reading (Counts/Min)	Geiger Mueller Reading (Mr/Hr)
BADGER II						
1	4O2	1315	10	1300/3000		.05
2	4C4	1330	10	1300/1300		.04
3	4E6	1345	10	1200/1200		.03
4	4F6	1400	10	1100/1100		.04
5	4A½5	1415	10	500/500		.04
6	3B4	1430	10	480/480		.05
7	3B1	1445	10	480/2600		.5
8	3C1	1500	10	1500/2700		.4
9	3F1	1515	10	530/530		.1
23 APRIL						
1	2C2	0948	40	400/1100	200	.05
2	2C0	1000	45	400/400	240	.03
3	2E0	1011	45	400/400	320	.02
4	3E2	1019	50	380/380	250	.05
5	3D2	1023	35	370/370	-	.02
6	3D3	1026	40	380/380	400	.03
7	3C3	1030	40	380/380	400	.03
8	3C5	1044	50	400/400	-	.02
9	3A5	1052	80	410/410	400	.08
10	3A6	1055	80	400/400	-	.05
11	4A6	1103	55	410/410	-	.03
12	4C4	1112	75	410/410	-	.07
13	1D1	1130	75	420/420	-	.05
14	1C3	1139	75	410/410	-	.03
15	1C5	1145	75	410/410	-	.02
16	2A5	1159	90	400/400	-	.02
17	2B4	1203	95	400/400	-	.02
18	2C4	1207	30	390/390	-	.02

TABLE C.3

Aerial Cloud Trackers' Report - (Hounddog I, IV) - Shot 3 22 April 1952 (See Fig. A.2) (Monitors: Capt. Odle and Capt Eaton) (Code: Hounddog - B-29 aircraft).

Report Number	Grid Position (Ref. Fig. A.2)	Time of Report (PST)	Mean Sea Level Altitude (Ft)	B-21 Meter Reading (Millivolts B.G./B.G.Cont.)	Rate Meter Reading (Counts/Min)	Geiger Mueller Reading (Mr/Hr)
HOUNDDOG I						
1	2C1	1017	20000			---
2	2B1	1042	20000			9.0
3	2A0	1100	20000			7.0
4	2A3	1123	22000			.4
5	2B1	1130	22000			3.0
6	2B0	1134	22000			19.0
7	2B4	1143	22000			4.0
8	2C4	1147	-----			8.0
9	2E6	1235	26000			18.0
10	2D7	1246	26000			3.5
11	2C6	1255	26000			4.0
12	2B9	1305	26000			2.0
13	2D7	1315	26000			30.0
14	2G7	1328	26000			110.0
15	2H8	1335	26000			7.0
16	2E5	1400	26000			14.0
17	2E5	1428	15000			0.1
HOUNDDOG IV						
1	401	1015	11000			0.5
2	4A0	1030	8500			0.0
3	2C0	1051	13000			20.0
4	2B1	1108	13000			50.0
5	2A1	1135	8500			7.0
6	2D2	1206	10000			0.4
7	2E5	1216	10000			0.3
8	2G7	1226	10000			0.3
9	2D4	1236	10000			0.2

TABLE C.4

Fixed Air Sampling and Fall-out Tray Report - Shot 3 - 22 April 1952 *

CODE	STATION	AIR CONCENTRATION $\mu c/m^3$ 1 Hr.	AIR CONCENTRATION $\mu c/m^3$ 24 Hrs.	F. O. TIME AFTER H-HOUR	FALL-OUT TRAYS d/m	FALL-OUT TRAYS Part/Tray	FALL-OUT TRAYS μc/Part	PARTICLE SIZE MMD	PARTICLE SIZE $<5\mu$	BACKGROUND RECORDER Arrival Time	BACKGROUND RECORDER High Reading Mr/Hr
CP	CP	.232	9.68×10^{-3}	3	228,000	10	$.691 \times 10^{-2}$	1.2	84	-	-
M	MERCURY	209×10^{-3}	871×10^{-3}	7	25,800	8	9.77×10^{-4}	.014	99.4	-	-
IS	INDIAN SPGS	141×10^{-3}	5.86×10^{-3}	8	80,000	564	4.27×10^{-5}	.15	99.4	-	-
LV	LAS VEGAS	19.5×10^{-3}	$.814 \times 10^{-3}$	12	19,000	75	7.61×10^{-5}			-	-
NE	NELLIS AFB	4.18×10^{-3}	$.174 \times 10^{-3}$	12	4,100	4	3×10^{-4}			-	-
GJ	GLENDALE JCT	3.67×10^{-3}	$.153 \times 10^{-3}$	12	3,200	6	1.6×10^{-4}			-	-
AL	ALAMO	12.1×10^{-3}	$.506 \times 10^{-3}$	18	1,970	7	8.56×10^{-5}			-	-
CS	CRYSTAL SPGS	15.9×10^{-3}	$.663 \times 10^{-3}$	18	10,400	31	1.04×10^{-4}			-	-
CA	CALIENTE	1.5×10^{-3}	$.063 \times 10^{-3}$	18	765	15	1.33×10^{-5}			-	-
PI	PIOCHE	3.26×10^{-3}	$.137 \times 10^{-3}$	--	-------	--	---------			-	-
ELY	ELY	1.71×10^{-3}	$.072 \times 10^{-3}$	18	2,920	17	5.3×10^{-5}			-	-
CU	CURRANT	2.67×10^{-3}	$.111 \times 10^{-3}$	18	18,700	1,250	$.456 \times 10^{-5}$			-	-
WS	WARM SPRINGS	2.55×10^{-3}	$.106 \times 10^{-3}$	18	3,260	15	6.54×10^{-5}			-	-
TO	TONOPAH	2.48×10^{-3}	$.103 \times 10^{-3}$	18	6,850	8	2.6×10^{-4}			-	-
BE	BEATTY	6.44×10^{-3}	$.268 \times 10^{-3}$	18	1,400	7	$.6 \times 10^{-5}$			-	-
GM	GROOM MINE	65.4×10^{-3}	2.72×10^{-3}	10	1,170	10	3.6×10^{-5}	9	38	-	-
LM	LINCOLN MINE	24.9×10^{-3}	1.04×10^{-3}	12	956	5	5.8×10^{-5}			-	-
PAR	PAHRUMP	384×10^{-3}	16.0×10^{-3}	5	1,815	5	1.1×10^{-4}			-	-

*See Explanatory Notes -(Page 79)

TABLE C.5

Weather Data - Pibal Readings Taken at CP - 22 April 1952 - Shot 3

Time (PST)	Altitude in Ft. m.s.l.	Direction in Degrees	Speed in Knots
0300	Surface	030	03
	5,000	070	04
	6,000	030	04
	7,000	020	05
	8,000	030	05
	9,000	360	06
	10,000	320	09
	15,000	330	17
	20,000	340	15
	25,000	340	20
	30,000	330	33
1000	Surface	160	10
	5,000	140	06
	6,000	150	04
	7,000	100	03
	8,000	030	02
	9,000	340	04
	10,000	030	09
	15,000	340	16
	20,000	330	15
	25,000	330	12
	30,000	300	20
	35,000	300	21
	40,000	230	18

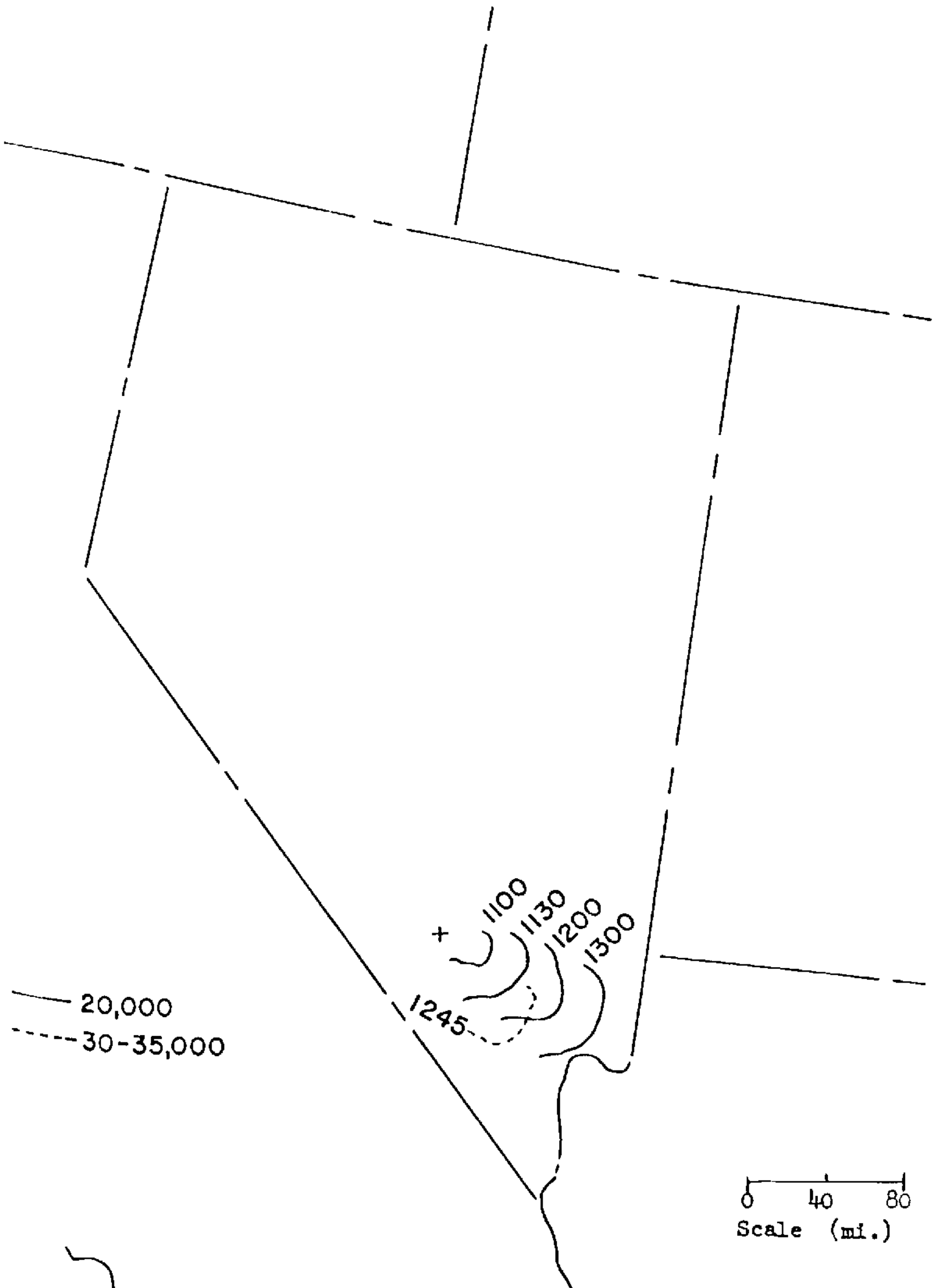


Fig. C.1 Cloud Progression, Shot 3

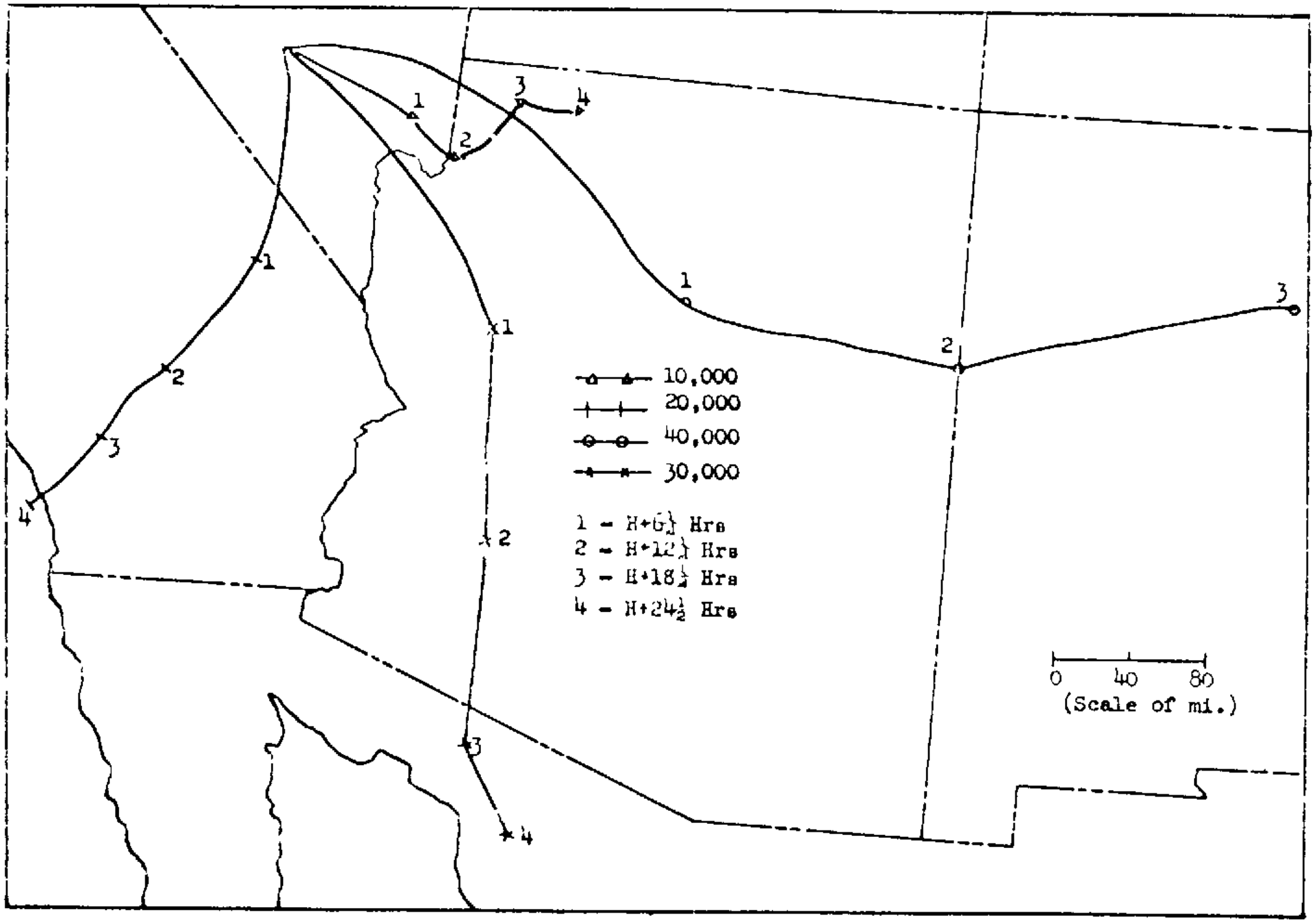


Fig. C.2 Cloud Trajectory, Shot 3

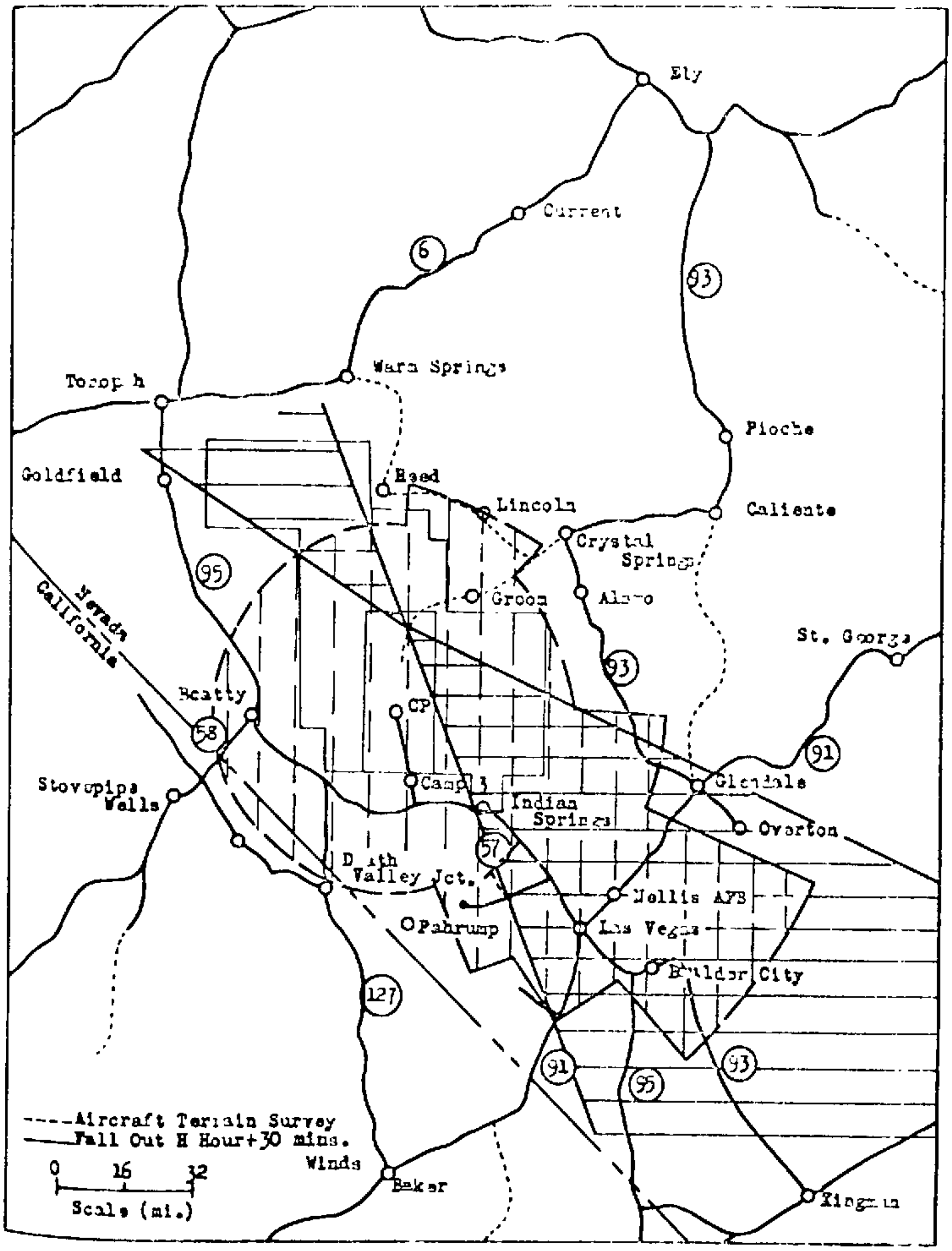
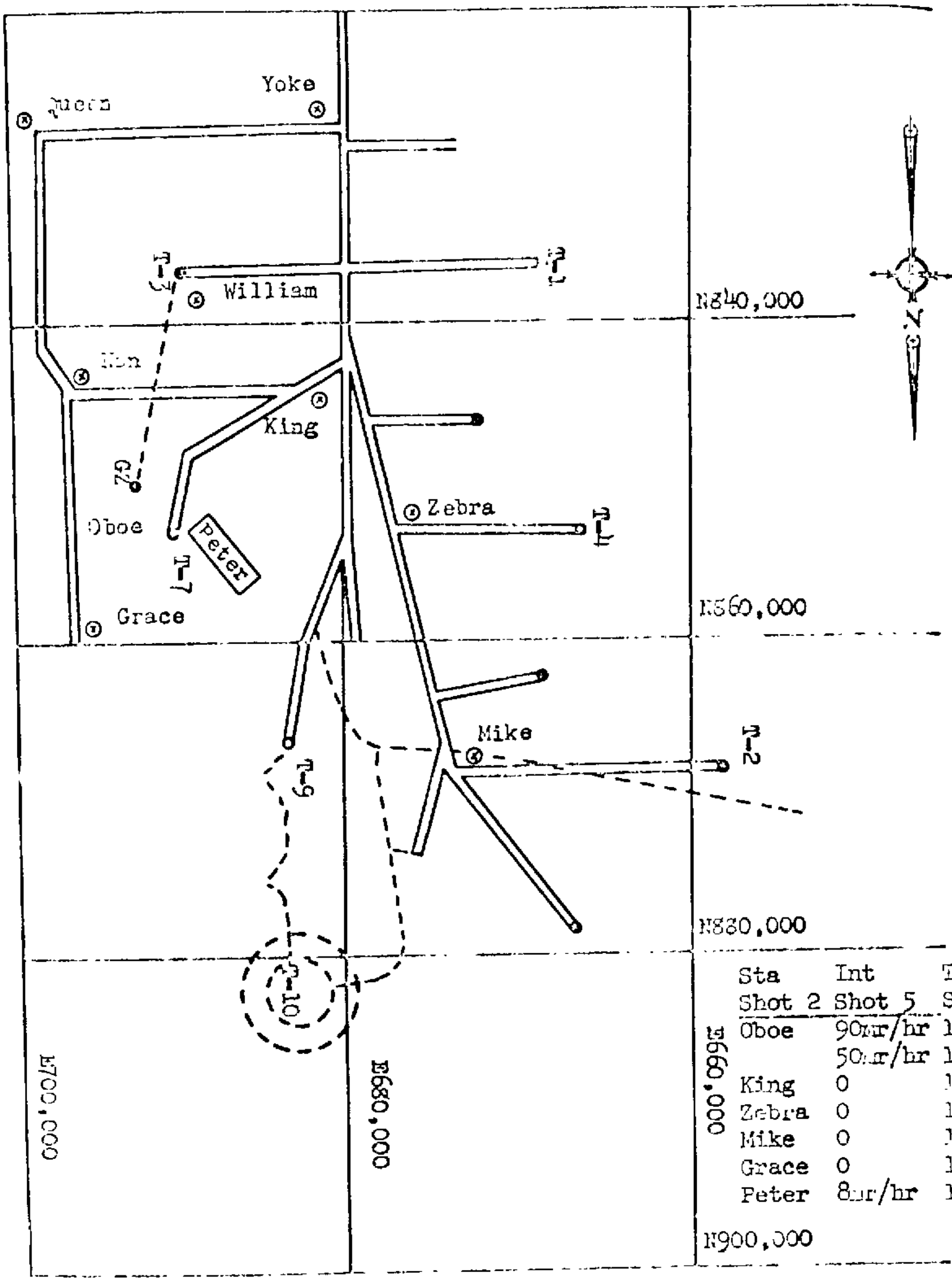


Fig. C.3 Fall-out Forecast and Area Covered by Surveys, Shot 3



Sta Shot 2	Int Shot 5	Time Shot 3
Oboe	90mr/hr	1020
	50mr/hr	1000
King	0	1005
Zebra	0	1008
Mike	0	1010
Grace	0	1017
Peter	8mr/hr	1003

Fig. C.4 First Initial Survey with Helicopter, Shot 3

TABLE C.6

Monitors' Survey Report - Shot 3 - 22 April 1952

	INTENSITY					
Stake	22 April 52		23 April 52		24 April 52	
No.	Mr/Hr	Time	Mr/Hr	Time	Mr/Hr	Time
GZ.	90	102[illegible]	14	0655	6	0519
1	80	1026	14	0654		
2	86	1028	12	0654	6	0517
3	100	1028	11	0653	5	0515
4	85	1028	8.8	0653	4.3	0513
5	44	1028	7	0652	3.5	0511
6	34	1027	6.5	0652	2.8	0509
7	26	1026	4	0651	2	0507
8	20	1025	2.6	0651	1	0505
9	14	1024	1.4	0650		
10	10	1023	.9	0650	.9	
11	8	1023				
12	4	1021				
13	3	1020				
14	2	1019				
31	80	1029	12	0705	4.3	0534
32	70	1029	11	0705	4.1	0533
33	60	1030	10	0706	3.9	0533
34	50	1030	9.2	0706	3.4	0532
35	40	1031	7.6	0707	3.1	0531
36	26	1032	6	0707	2.8	0531
37	21	1032	4.8	0708	2.5	0530
38	16	1033	2.9	0709	1.3	0530
39	12	1034				
40	8	1035				
41	6	1036				
42	4	1037				
43	2	1038				
44	2	1039				
61	85	1026	20	0600	4.4	0525
62	72	1025	17	0559	4.2	0525
63	65	1024	15	0559	4.0	0526
64	54	1023	13	0558	3.4	0527
65	42	1022	10	0558	3.0	0527
66	35	1021	9	0557	2.7	0528
67	28	1020	8	0557	2.6	0528
68	21	1020	6	0556	2.4	0529
69	16	1019	3.5	0556	1.9	0529
70	12	1018	2.2	0555		
71	8	1017	1.9	0555		
72	5	1016				
73	3	1015				
74	2	1014				

TABLE C.6 (Cont'd.)

Stake No.	INTENSITY					
	22 April 52		23 April 52		24 April 52	
	Mr/Hr	Time	Mr/Hr	Time	Mr/Hr	Time
91	86	1026	18	0613	7	0558
92	73	1027	17	0613	8	0556
93	70	1027	16	0612	4.6	0554
94	50	1028	13.5	0612	3.8	0552
95	37	1029	9.6	0611	2.8	0550
96	32	1030	6	0611	2.2	0548
97	24	1031	4	0610	2	0546
98	20	1032	3	0610	1.8	0544
99	14	1033	1.8	0609	1.2	0542
100	10	1034	1	0609	1	0540
101	7	1035				
102	4.6	1035				
103	2.8	1036				
104	2	1037				
121	80	1032	14	0656	6	0521
122	70	1033	12	0656	5	0523
123	60	1034	10	0657	4	0525
124	50	1035	8.6	0657	3	0529
125	40	1036	7	0658	3	0529
126	25	1037	5	0658	2	0531
127	22	1038	3.8	0659	1.4	0533
128	14	1039	1.9	0659	1	0535
129	11	1040				
130	8	1041				
131	6	1042				
132	5	1043				
133	3	1044				
134	1	1045				
151	80	1233	13	0704	4.2	0538
152	75	1232	11.5	0704	4.2	0538
153	60	1231	10	0703	5.0	0539
154	44	1230	9	0703	3.4	0539
155	36	1229	7	0702	3.2	0540
156	29	1229	5.2	0702	2.7	0540
157	21	1228	4.8	0701	2.4	0541
158	14	1227	3.6	0701	2.0	0541
159	10	1226			1.5	0542
160	7	1225				
161	6	1224				
162	4	1223				
163	2.8	1222				
181	50	1030	18	0604	5	0550
182	48	1030	17	0604	4.2	0548
183	46	1033	13.5	0603	3.7	0548
184	37	1035	10	0603	3.3	0547

TABLE C.6 (Cont'd.)

	INTENSITY					
Stake	22 April 52		23 April 52		24 April 52	
No.	Mr/Hr	Time	Mr/Hr	Time	Mr/Hr	Time
185	29	1036	9	0602	3.0	0546
186	22	1037	7	0602	2.7	0546
187	16	1038	6	0601	2.4	0545
188	10	1038	2.8	0601	1.7	0545
189	6	1038				
190	4	1039				
191	2	1039				
192	1	1040				
211	50	1027	17	0608	7	0602
212	49	1027	15	0608	6	0604
213	39	1026	13.5	0607	5	0606
214	29	1026	9.7	0607	4	0608
215	22	1025	8	0606	3	0610
216	15	1025	6	0606	2	0612
217	10	1024	3.5	0605	1.6	0614
218	6	1023	2.2	0605	1.2	0616
219	4.3	1022			1	0618
220	4.2	1021				
221	2.9	1021				
222	1.9	1020				
223	1.2	1020				
224	.8	1019				
225	.5	1018				
226	.4	1017				
227	.4	1016				
228	.3	1015				

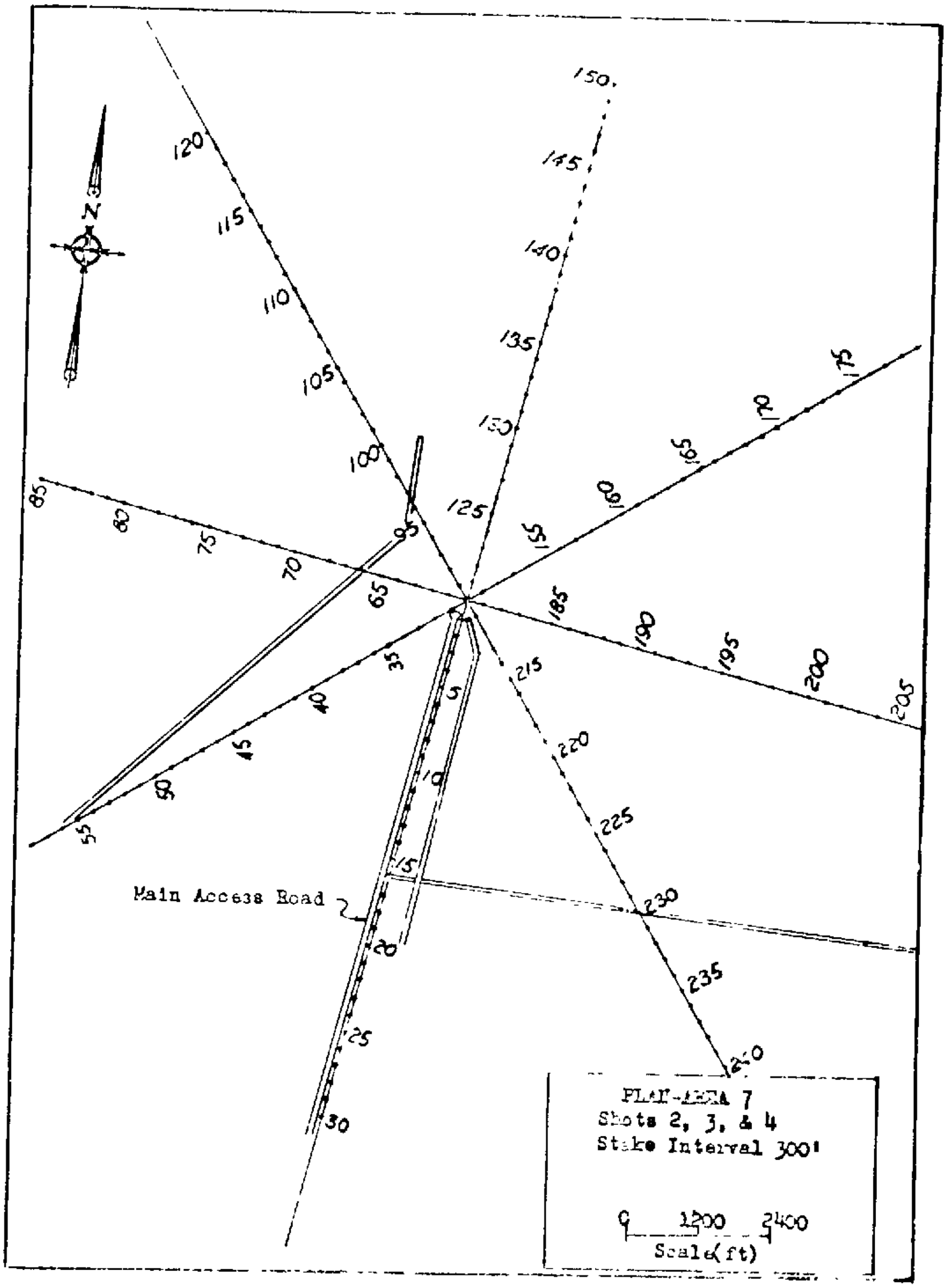


Fig. C.5 Plan-Area 7 for Shots 2, 3, and 4

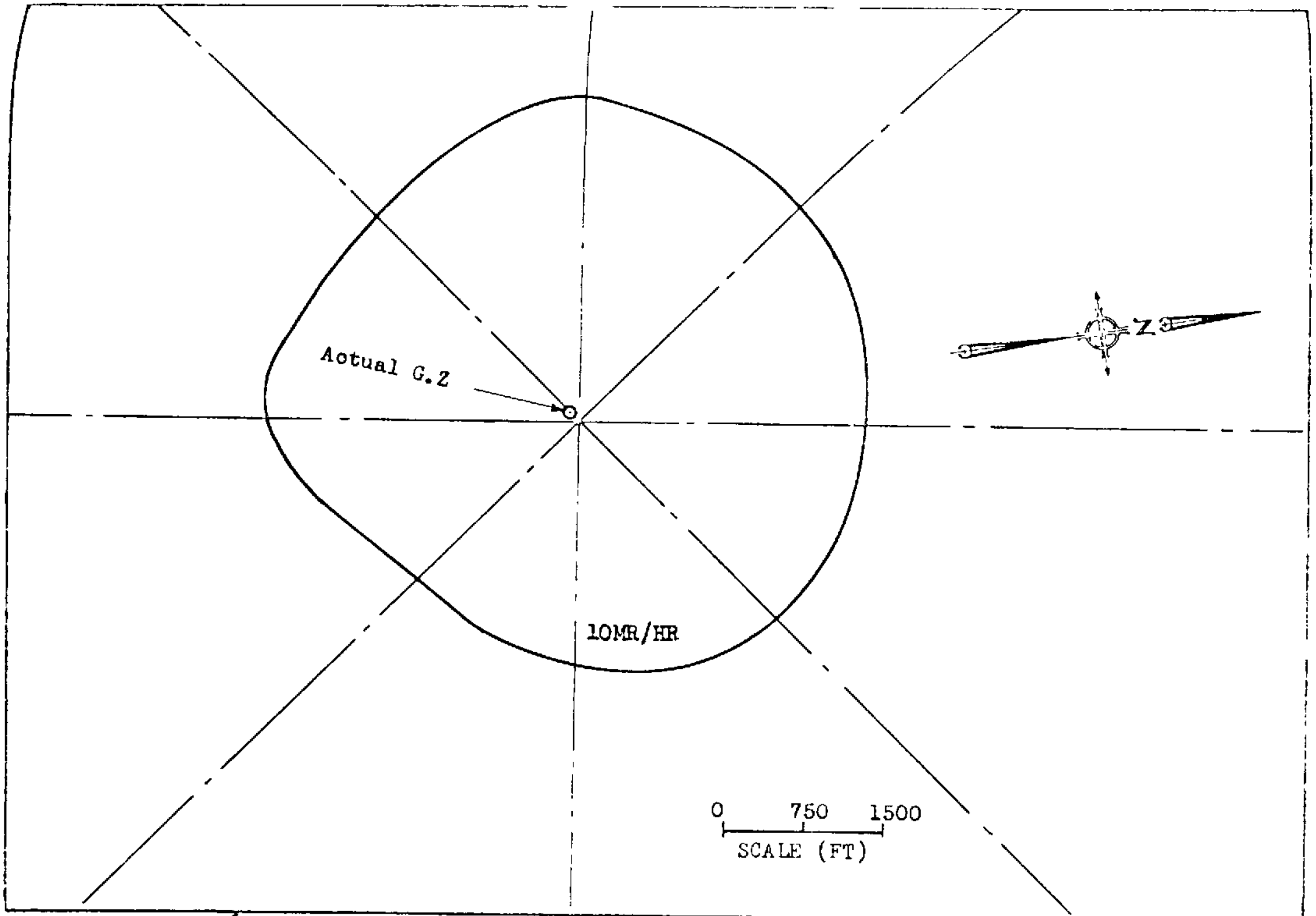


Fig. C.6 Isointensity Overlay, Initial Survey, 1015-1040, Shot 3 (See Fig. C.5)

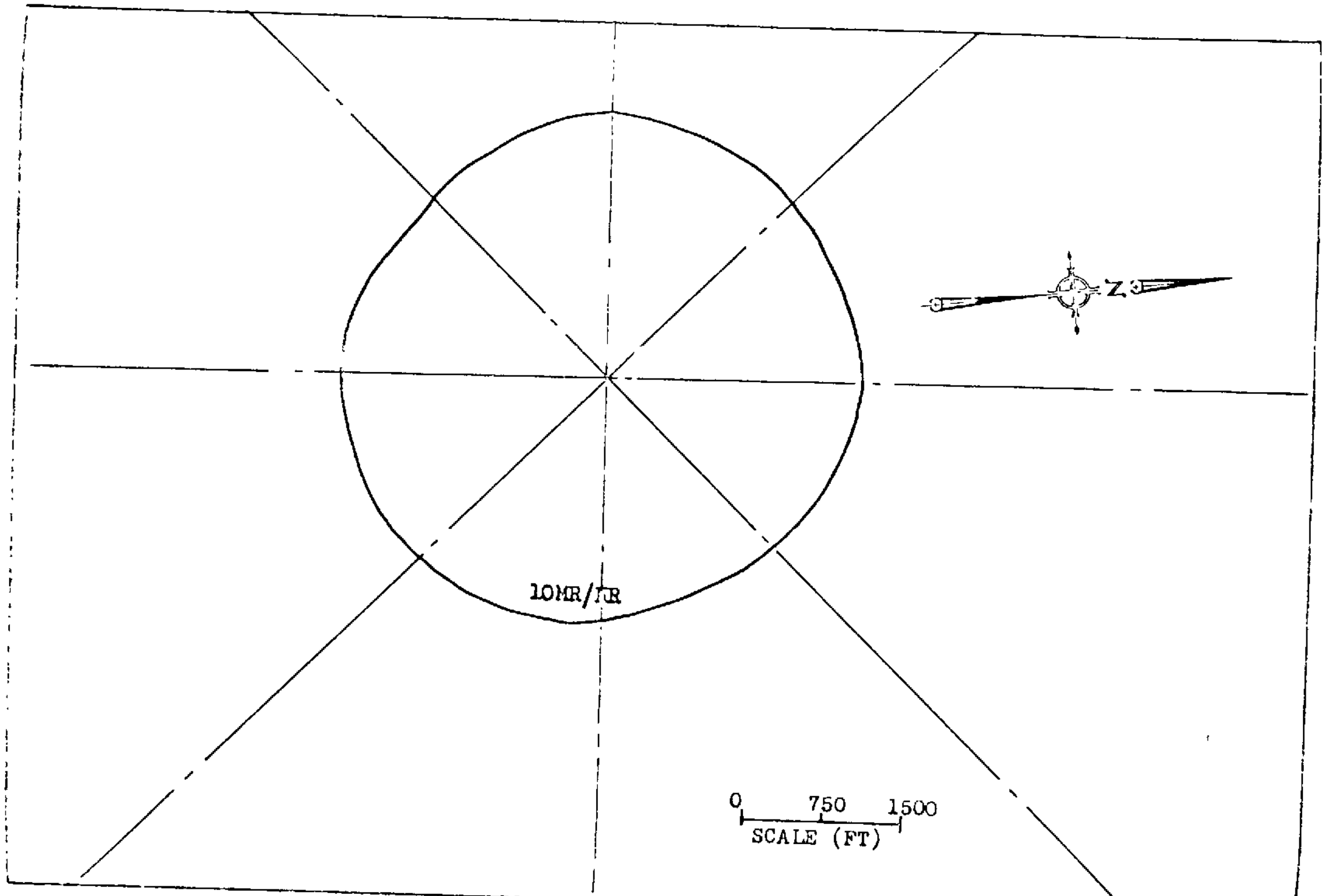


Fig. C.6.1 Isointensity Overlay, 1530, Shot 3, (See Fig. C.5)

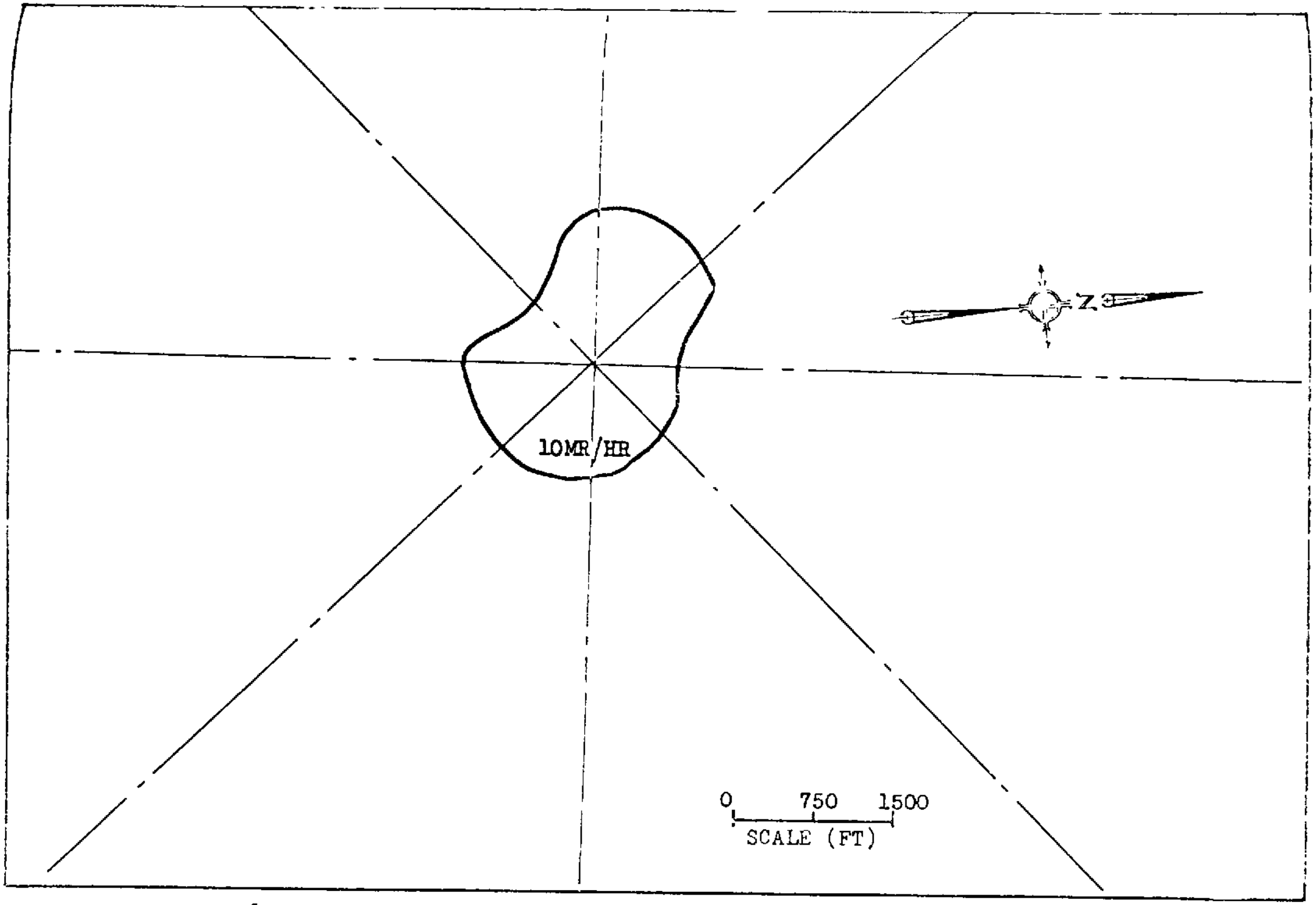


Fig. C.6.2 Isointensity Overlay, 0645-1045, Shot 3 (See Fig. C.5)

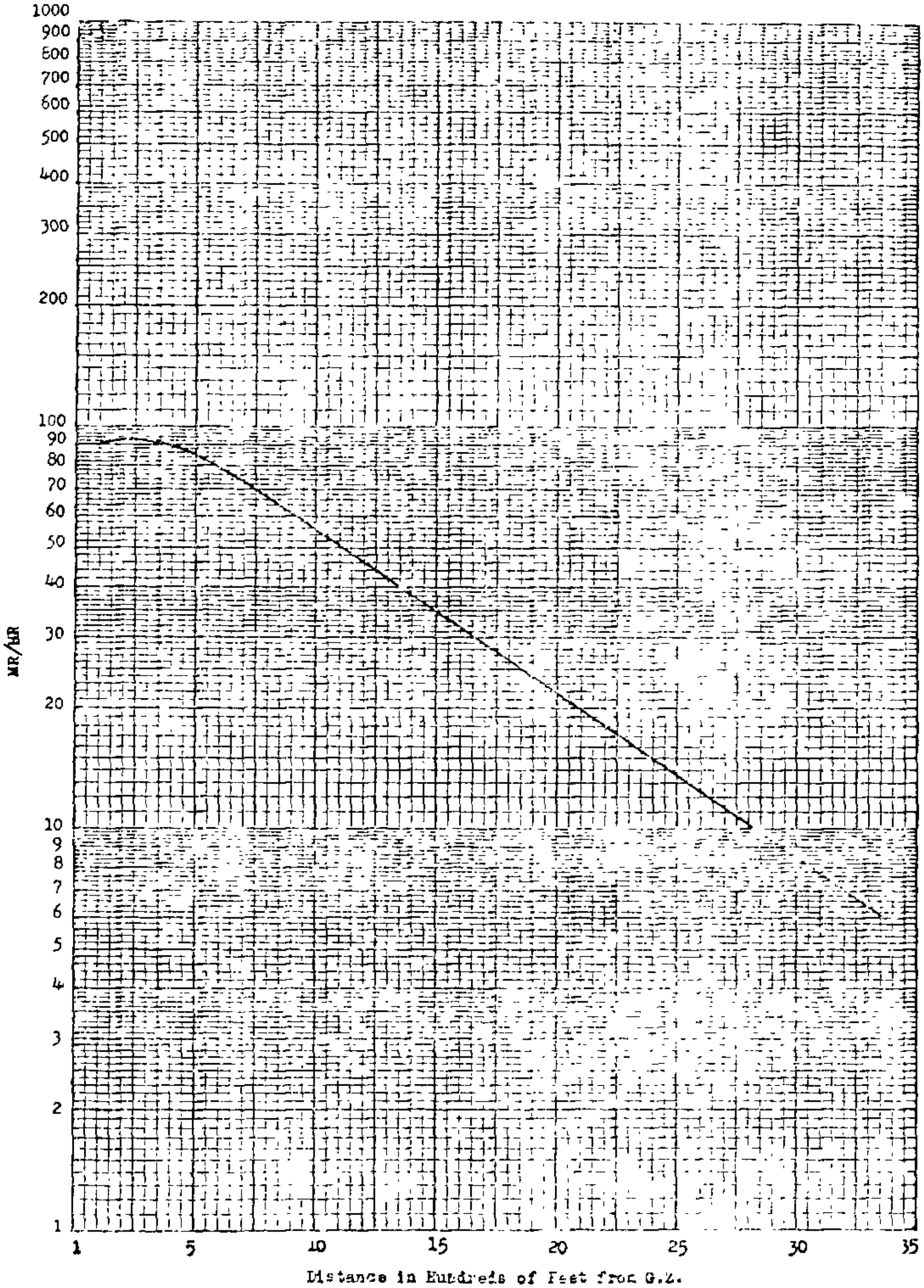


Fig. C.7 Ground Contamination (mr/hr) vs Distance from Ground Zero, Shot 3, 1030 (PST) (H+ 1 hour)

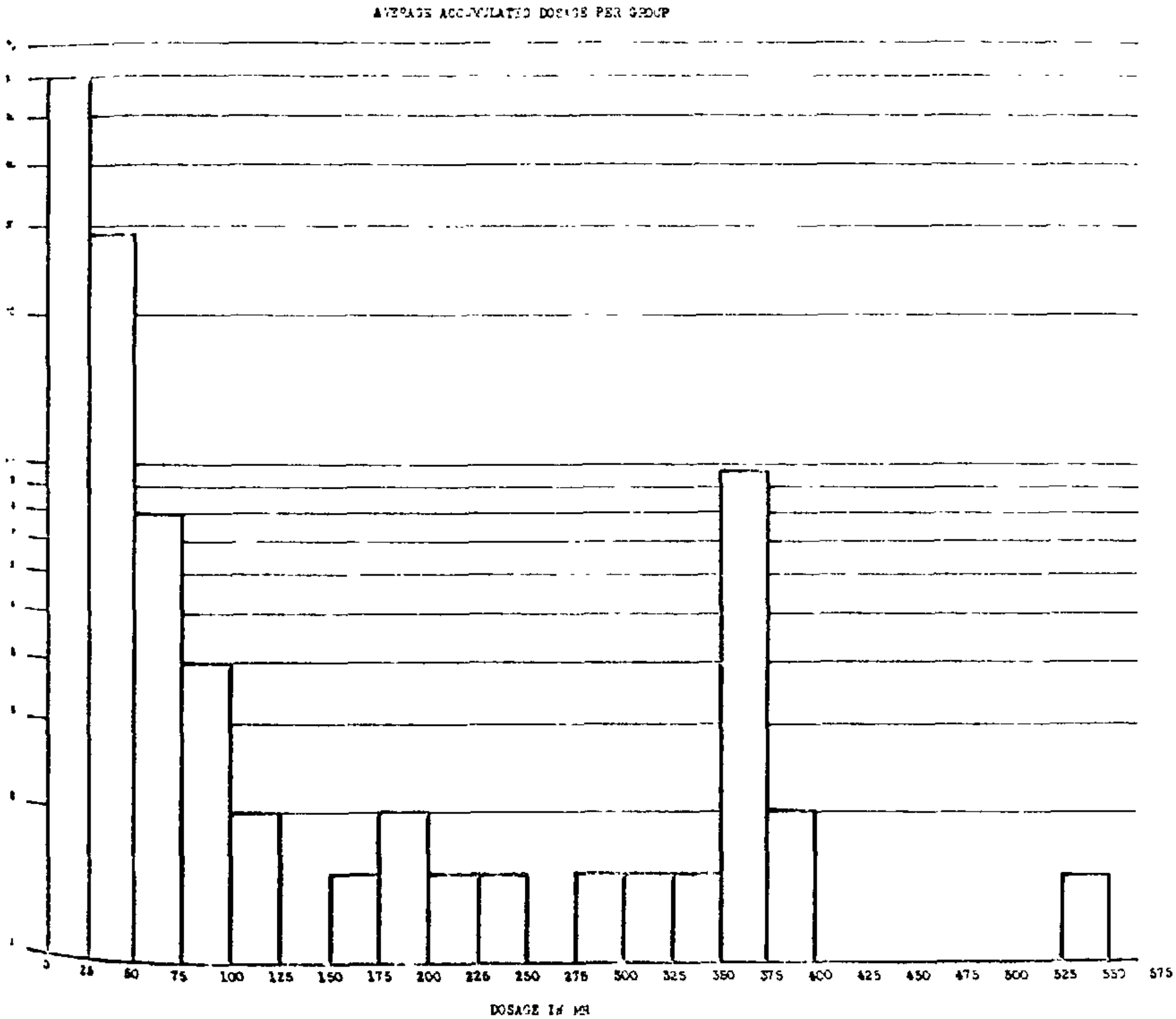


Fig. C.8 Accumulated Dose Report (For personnel issued film badges during period C to D-1 Days)

APPENDIX D

OPERATION TUMBLER-SNAPPER
Shot 4 - 1 May 1952
(Period Covered - 1 May-6 May 1952)

OPERATIONAL DATA

Location: Area 7 - Sta. 3
Height of Burst: 1040 ft.
Yield (KT): 19.6
Time Fired: 0829 (PST)

D.1 OFF-SITE OPERATIONS DEPARTMENT

So far as the Off-Site Operations Department was concerned, Shot 4 was very similar to the previous three shots, in that no readings of any significance were measured in the off-site areas, the highest being 4 mr/hr in the Glendale region. The data obtained by the Off-Site Department are shown in Figures D.1 through D.3 and Tables D.1 through D.5.

D.2 MATERIEL AND LOGISTICS DEPARTMENT

By this time the mileage on the carryalls being used by the Off-Site Operations Department was mounting up and maintenance was becoming a major problem. Off-Site Operations requested additional radio-equipped vehicles to cover more territory in a satisfactory manner for the following four tower shots. To replace the deadlined vehicles and those anticipated to be deadlined within the next week, five radio-equipped sedans were procured from the AEC and assigned to the Off-Site Operations Department. During this test period 709 sets of protective clothing, 90 MX-5's and 162 T1B instruments were issued.

D.3 ON-SITE OPERATIONS DEPARTMENT

The area for Shot 4 was the same as for Shots 2 and 3. This bomb, detonated at 1040 feet, with a yield of approximately 19.7 KT,

Consequently, the levels of radioactive contamination found in the target area after detonation were much higher than for any of the previous shots in this test series. The maximum reading at ground zero at H+1 was approximately 300 r/hr, and the 10 mr/hr line extended to approximately one mile from ground zero (see Fig. D.6). For the first time in this series of test shots, delineation of the 10 r/hr line was made and measurements of residual radiation intensity levels well above the range of the AN/PDR-T1B area survey meter (maximum range 50 r/hr) occurred. The high intensity readings above 50 r/hr taken in the vicinity of ground zero was measured with an experimental instrument ("Jasper"), a simplified wide-range ionization chamber survey meter developed by the U. S. Army Signal Corps. It will be noted from the monitors' readings (Table D.6) and the isointensity plots (Figs. D.5 through D.5.4) that the 10 r/hr line and high intensities were not located or plotted for the afternoon survey of D Day or the morning area survey on D+1 Day. These were intentionally omitted in order to keep the accumulated individual doses of survey team personnel as low as possible consistent with the determination of the current radiological situation in the target area. Decay factors were fairly well known from the results of the previous three shots, and the 10 r/hr line on the

Radiological Situation Map was plotted from computed data. The Test Director's Operation Order #1-52, Annex D scheduled 19 programs and 78 projects for participation in technical test activities. However, due to the high levels of contamination, much recovery work was unavoidably delayed until after D 1 Day. Consequently, Rad-Safe monitors were assigned to recovery and work parties each day thereafter as long as they were required. This area was not declared open until 10 days after shot, at which time the intensity was reduced to less than 10 mr/hr. The high level of radioactivity in metallic materiel and equipment exposed by test personnel in the target area, hampering recovery work and increasing the work load on both the Personnel and Vehicle Decontamination Sections during this period. In many cases normal decontamination procedures failed to reduce sufficiently the contamination on vehicles and test equipment, and it was necessary that they be set aside in the "hot" motor parking area, or in the Decontamination Station Area, to await natural decay. Accumulated doses for individuals after Shot 4 showed a marked increase over those received after previous shots, as is illustrated by Figure D.7. At this time two Rad-Safe people received exposures slightly higher than 3.9 r. On 3 May 1952, to enable the On-Site Operations Officer to exercise better control over individual doses and prevent further over-exposures, the Dosimetry and Records Section, which had been under the supervision of the Director of Logistics and Materiel, was transferred to the On-Site Operations Department.

The information obtained by the On-Site Operations Department is shown in Table 6 and Figs. D.4 through D.7.

TABLE D.1

Ground Mobile Monitors' Report - Shot 4 - 1 May 1952
(See Fig. A.1) (Normal background: .02 - .04 mr/hr)

TIME	READING Mr/Hr	GRID LOCATION (Ref.Fig. A.1)	LOCATION IN DETAIL	REMARKS
0830	.02	D3 R2	Warm Springs	
0845	.02	D2 R1	Clarks Station	
0900	.02	C5 R0	6 mi. NE of Tonopah	
0915	.02	C4 R0	Tonopah	
0930	.02	C4 S5	10 mi. S. of Tonopah	
0945	.02	C4 S5	25 mi. S. of Tonopah	
1000	.02	C4 S4	Goldfield	
1007	.03	F2 T4	3 mi. N.of Glendale on US 93	Background
1015	.02	C4 S5	20 mi. S. of Tonopah	
1015	.03	F1 T4	7 mi. N. of Glendale on US 91	
1020	.02	F1 T4	11.7 mi. N. of Glendale on US 93	
1025	.02	E5 T1	Las Vegas	
1025	.02	F1 T4	14 mi. N of Glendale on US 93	
1030	.03	F1 T4	17 mi. N of Glendale on US 93	
1030	.02	C4 R5	10 mi. S of Tonopah	
1035	.02	F1 T4	20.6 mi. N of Glendale on US 93	
1040	.03	F0 T5	23.6 mi. N of Glendale on US 93	
1045	.04	F0 T5	26.8 mi. N of Glendale on US 93	
1045	.02	C4 R0	Tonopah	
1048	.02	F0 T2	15 mi. NE of Las Vegas on US 93	
1050	.04	F0 T5	29.5 mi. N. of Glendale on US 93	
1055	.02	F0 T3	32.5 mi. N. of Glendale on US 93	
1100	.02	C4 R0	Tonopah	
1100	.04	F0 S0	35.9 mi. N of Glendale on US 93	
1105	.02	E1 T3	Jct. US 95/Mercury Rd.	
1105	.03	F0 S0	39.9 mi. N of Glendale on US 93	
1110	.03	F0 S0	42.3 mi. N of Glendale on US 93	Background
1111	.1	F0 S0	44.8 mi. N of Glendale on US 93	.8 mi. area
1113	.15	F0 S0	44.0 mi. N of Glendale on US 93	.4 mi. area
1115	.02	E1 T3	40 mi. W of Las Vegas on US 95	
1115	.3	F0 S0	44 mi. N of Glendale on US 93	.8 mi. area
1115	.02	C5 R0	10 mi. E of Tonopah on US 6	
1116	.5	F0 S0	44.8 mi. N of Glendale on US 93	.3 mi. area
1117	.8	F0 S0	45.1 mi. N of Glendale on US 93	.4 mi. area
1118	1.1	F0 S0	45.5 mi. N of Glendale on US 93	.7 mi. area
1119	1.5	E5 S1	46.1 mi. N of Glendale on US 93	.4 mi. area
1120	3.0	E5 S1	46.6 mi. N of Glendale on US 93	.7 mi. area
1121	4.0	E5 S1	47.3 mi. N of Glendale on US 93	5.2 mi. area
1130	.02	D3 R1	Clark's Station (on US 6)	
1130	.03	E2 T3	30 mi. W of Las Vegas on US 93	
1131	3.0	E5 S1	53.2 mi. N of Glendale on US 93	1.6 mi. Area

TABLE D.1 (Cont'd.)

TIME	READING Mr/Hr	GRID LOCATION (Ref.Fig. A.1)	LOCATION IN DETAIL	REMARKS
1133	2.0	E5 S1	54.8 mi. N of Glendale on US 93	
1135	.6	E5 S1	55.8 mi. N of Glendale on US 93	3.3 mi. area
1135	.2	E0 S2	Groom Mine Barricade	
1140	.5	E5 S1	59.1 mi. N of Glendale on US 93	1.6 mi. area
1141	.5	E5 S2	59.8 mi. N of Glendale on US 93	
1145	.4	E5 S2	61.4 mi N. Of Glendale on US 97	
1145	.02	E3 T3	20 mi. W of Las Vegas on US 95	
1150	.4	E4 S2	1.2 mi. N of Alamo on US 93	
1150	.04	E0 S2	2 mi. E of Groom Rd. Barricade	
1155	.3	E4 S2	4 mi. N of Alamo on US 93	3 mi. area
1200	.4	E4 S3	7.1 mi. N of Alamo on US 93	South to Hiko
1200	.04	E0 S1	5 mi. E of Groom Rd. Barricade	No radio con-
1200	.02	D3 R1	10 mi. E of Clark's Sta. on US6	tact with 7
1200	.02	E4 T1	10 mi. W.of Las Vegas on US 96	
1215	.02	E5 T1	Las Vegas	
1220	.02	E2 S2	On Groom Lake	
1220	.35	E4 S3	2.2 mi. S of Hiko on Nev. 38	
1225	.4	E4 S3	Jct. US 93/Nev 38	
1227	.2	E4 S3	2.2 mi. E of Jct. US 93/Nev 38 on US 93	10 mi. Area. Varies between .2 and .3
1230	.02	D3 R2	Warm Spgs.	
1230	.3	E4 S3	3.6 mi. E of Jct. US 93/Nev 38 on US 93	
1230	.04	E2 S2	N Edge of Groom Lake	
1232	1-2	E5 S1	46 mi. N of Glendale on US 93	
1235	.2	E4 S3	7 mi. E of Jct. US 93/Nev 38 on US 93	
1238	2.0-3.5	E5 S1	50 mi. N of Glendale on US 93	
1240	.02	E2 S2	Approaching Groom Mine	
1245	.02	E4 T2	20 mi. W of Las Vegas on US 95	
	.15	E4 S3	9.4 mi. E of Jct. US 93/Nev 38 on US 93	
	.02	D3 R1	16 mi. SW of Warm Spgs. on US 6	
1246	2.5-4.0	E5 S1	53 mi. N of Glendale on US 93	
1248	2.0	E5 S1	55 mi. N of Glendale on US 93	
1250	.2	E4 S3	12.1 mi. E of Jct. US 93/Nev 38 on US 93	
1251	1.0	E5 S2	57 mi. N of Glendale on US 93	
1254	.3-.5	E5 S2	59 mi. N of Glendale on US 93	
1255	.2-.3	E5 S2	63 mi. N of Glendale on US 93 (Alamo)	
1255	.1	E5 S3	14.1 mi. E of Jct. US 93/Nev 38 on US 93	
1300	.02	E2 S2	At Groom Mine	
1300	.02	E3 T2	30 mi. W of Las Vegas on US 95	
1300	.15	E5 S3	16.5 mi. E of Jct. US 93/Nev 38 on US 93	
1300	.02	C5 R0	Tonopah Air Base	
1305	.13	E5 S3	21 mi. E of Jct. US 93/Nev 38 on US 93	
1310	.1	E5 S3	23 mi. E of Jct US 93/Nev 38 on US 93	

TABLE D.1 (Cont'd.)

	READING Mr/Hr	GRID LOCATION (Ref.Fig. A.1)	LOCATION IN DETAIL	REMARKS
1315	.12	F0 S4	27 mi. E of Jct US 93/Nev 38 on US 93	
1315	.02	E1 T3	40 mi. W of Las Vegas on US 95	
1320	.08	F0 S4	29.1 mi. E of Jct US 93/Nev 38 on US 93	
1323	.2-.5	E4 S3	10 mi. N of Alamo on US 93	
1325	.2-.5	E4 S3	13 mi. N of Alamo on Nev 38	
1325	.12	F0 S4	32.2 mi. E of Jct US 93/Nev 38 on US 93	
1330	.02	E0 T3	50 mi. W of Las Vegas on US 95	
1330	.1	F1 S4	36 mi. E of Jct US 93/Nev 38 on US 93	
1330	.05-.15	E4 S3	18 mi. N of Alamo on US 93 (Hiko)	
1335	.08	F1 S4	3 mi. E of Jct US 93/Nev 38 on US 93	
1340	.06-.1	F2 S4	Caliente, Nev.	
1345	.02	C5 R0	Tonopah Air Base	
1350	.07	F2 S4	Caliente, Nev.	
1352	.2-.5	E4 S3	11 mi. N of Glendale on US 93	
1355	.05-.1	F2 S4	3 mi. W of Caliente on US 93	
1400	.08	F1 S4	6.1 mi. W of Caliente on US 93	
	.02	C5 R0	Tonopah Air Base	
1402	.2-.5	E4 S3	3 mi. N of Alamo on US 93	
1404	.2-.5	E4 S3	3 mi. N of Alamo on US 93	Spotty Contact with C-47
1405	.1	F1 S4	8.2 mi. W of Caliente on US 93	
1410	.2-.5	E4 S3	3 mi. N of Alamo on US 93	
1410	.06-.1	F1 S4	11.6 mi. W of Caliente on US 93	
1415	.07	F1 S4	14.6 mi. W of Caliente on US 93	
1415	.02	C5 R0	Tonopah Air Base	
1420	.08-.1	F1 S4	17 mi. W of Caliente on US 93	
1420	.2-.3	E5 S2	Alamo, Nev.	
1425	.06	F1 S4	14 mi. W of Caliente on US 93	
1430	.08	F1 S4	11 mi. W of Caliente on US 93	
1430	.02	C5 R0	Tonopah Air Base	
1435	.07	F1 S4	7 mi. W of Caliente on US 93	
1440	.08	F2 S4	5 mi. W of Caliente on US 93	
1442	.2-.3	E5 S2	5 mi. S of Alamo on US 93	
1443	.2-.5	E5 S2	6 mi. S of Alamo on US 93	
1445	.5-.7	E5 S1	7 mi. S of Alamo on US 93	
1445	.02	C4 R0	Tonopah, Nev.	
1447	1.0-1.5	E5 S1	8 mi. S of Alamo on US 93	
1450	1.5-2.0	E5 S1	10 mi. S of Alamo on US 93	
1453	2.0	E5 S1	11 mi. S of Alamo on US 93	
1454	1.0-7.0	E5 S1	12 mi. S of Alamo on US 93	
1458	.8-1.2	E5 S1	16 mi. S of Alamo on US 93	
1500	.3-.6	E5 S1	17 mi. S of Alamo on US 93	
1500	.04	E2 S2	Control Point	
1500	.02	C4 R0	Tonopah, Nev.	
1502	.2-.3	F0 S0	18 mi. S of Alamo on US 93	

TABLE D.1 (Cont'd.)

TIME	READING mr/hr	GRID LOCATION (Ref. Fig. A.1)	LOCATION IN DETAIL	REMARKS
15[illegible]4	.[illegible]-.1	F0 S0	19 mi. S of Alamo on US 93	
15[illegible]	.[illegible]-.[illegible]4	F[illegible] S0	21 mi. S of Alamo on US 93	
1513	.[illegible]-.15	F0 S0	26 mi. S of Alamo on US 93	
1515	.[illegible]	E2 S2	N End of Yucca Valley, to Groom	
1516	.[illegible]-.15	F0 T0	2[illegible] mi. S of Alamo on US 93	
152[illegible]	.[illegible]	F2 S4	4.2 mi. W of Caliente on US 93	
1521	.[illegible]-.1	F0 T5	35 mi. S of Alamo on US 93	
1523	.[illegible]-.08	F0 T5	37 mi. S of Alamo on US 93	
152[illegible]	.[illegible]-.1	F1 T4	40 mi. S of Alamo on US 93	
153[illegible]	.[illegible]	E2 S2	Groom Rd. Barricade	
1535	.[illegible]	F0 S4	17 mi. N of Caliente on US 93	
1545	.[illegible]	E2 S2	N of Groom Rd. Barricade	
1545	.[illegible]2-.[illegible]7	F2 T5	55 mi. S of Alamo on US 90	
155[illegible]	.[illegible]	E5 S3	27 mi. W of Caliente on US 93	
1555	.[illegible]-.15	F2 T5	62 mi. S of Alamo on US 93	
16[illegible]	.[illegible]-.15	F2 T5	Glendale Jct Nevada	
16[illegible]	.[illegible]2	C4 S5	20 mi. S of Tonopah on US 95	
16[illegible]	.[illegible]-.[illegible]8	E5 S3	35.9 mi. W of Caliente on US 93	
1[illegible]7	.[illegible]	E4 S4	Jct US 93/Nev 38	
161[illegible]	.[illegible]	E2 S2	Near Jct Nev 25 and Groom Mine Rd.	
1615	.[illegible]2	C4 S3	Goldfield (on US 95)	
1625	.1-.15	E4 S2	Alamo	
1635	.[illegible]	E2 S2	Crossing Groom Lake	
1645	.12	E5 S3	3 mi. S of Alamo on US 93	
165[illegible]	.1	E5 S3	9 mi. S of Alamo on US 93	
1655	.[illegible]	E5 S3	11 mi. S of Alamo on US 93	
17[illegible]	.1	E5 S3	12.5 mi. S of Alamo on US 93	
1720	.[illegible]	F0 S1	24 mi. S of Alamo on US 93	
1725	.[illegible]	F0 S1	29.1 mi. S of Alamo on US 93	
173[illegible]	.[illegible]	F1 S1	32.3 mi. S of Alamo on US 93	
1735	.[illegible]	F1 S1	38.9 mi. S of Alamo on US 93	
174[illegible]	.13	F1 S1	43.2 mi. S of Alamo on US 93	
1755	.1[illegible]	F2 S4	54.9 mi. S of Alamo on US 93	
1915	.[illegible]5	F0 T1	Nellis AFB	
1935	.[illegible]5	E5 T1	Las Vegas	
203[illegible]	.[illegible]5-.1	E2 T2	Jct US 95/Nev 52 to Indian Spgs.	

TABLE D.2

Aerial Terrain Survey Report (Badger I & II and Woodchuck I) - Shot 4 - 1 May 1952 (Reference Fig. A.2) (Code: Badger - C-47 aircraft. Woodchuck - L-20.)

Report Number	Grid Position (Ref. Fig. A.2)	Time of Report (PST)	Absolute Altitude (Ft)	B-21 Meter Reading (Millivolts B.G./B.G.Cont.)	Rate Meter Reading (Counts/Min)	Geiger-Mueller Reading (Mr/Hr)
(1 May 1952)						
BADGER I						
1	3A1	1148	1000	85/85	400	.025
2	3O1	1153	1500	90/90	400	.02
3	4A1	1157	1000	90/90	600	.03
4	4B1	1202	1000	90/90	600	.025
5	4C1	1207	1000	90/130	700	.035
6	4(B.8) 0.8	1208	1000	90/175	700	.045
7	4(B.4) 0	1212	700	80/105	700	.025
8	1(B.3) 0.5	1216	1500	100/145	800	.04
9	1(A.5) 2	1220	1500	110/180	800	.035
10	1A(2.2)	1223	1000	130/285	900	.08
10-A	1(0.5) 3	1225	1000	130/470	1000	.085
11	1(0.5) 4	1231	1500	90/90	800	.025
12	1O5	1235	800	90/90	800	.025
13	2(0.5) 6	1238	2000	80/80	700	.02
14	2A7	1243	1000	75/75	800	.015
15	2B7	1246	800	75/75	800	.02
16	2B8	1251	2000	75/75	800	.02
17	2A8	1255	1500	75/75	800	.020
18	2(0.5) 7	1259	800	80/80	800	.025
19	2O6	1304	1000	80/80	800	.02
20	1(0.5) 5	1309	500	90/300	900	.10
20-A	1(0.7) 4.5	1311	800	90/700	1300	.18
21	1A4	1314	500	90/410	900	.12
22	1(A.5) 3	1319	1000	100/300	900	.08
23	1B2	1323	400	100/180	900	.035
24	1(B.5) 1	1327	500	100/180	2000	.03

TABLE D.2 (Cont'd.)

Report Number	Grid Position (Ref.Fig. A.2)	Time of Report (PST)	Absolute Altitude (Ft)	B-21 Meter Reading (Millivolts B.G./B.G.Cont.)	Rate Meter Reading (Counts/Min)	Geiger-Mueller Reading (Mr/Hr)
25	1C0	1330	400	100/100	900	.025
26	1D0	1334	1000	90/90	800	.02
27	1(C.5) 1	1339	1000	90/90	900	.02
28	1C2	1344	500	110/110	900	.03
29	1(B.5) 3	1348	1000	110/170	900	.035
30	1B4	1353	500	110/175	1000	.04
Special	1(A.5) 4.7	1355	600	110/250	1100	.055
31	1(A.5) 5	1359	1000	110/110	1000	.03
32	1A6	1403	1500	90/90	900	.025
33	1(0.5) 7	1406	1500	90/90	1000	.025
34	208	1411	1500	90/120	650	.03
35	2(0.5) 9	1415	500	90/90	650	.02
36	2A10	1419	800	80/80	650	.02
37	2B10	1424	700	85/85	650	.02
38	2C10	1430	1500	80/80	650	.015
39	2C11	1433	1000	90/90	650	.02
40	2C12	1438	1000	90/90	650	.015
41	2C13	1441	1500	90/90	650	.02
42	2C14	1445	200	90/90	800	.02
43	2C15	1448	500	95/95	700	.02
44	2B15	1451	1000	95/95	700	.025
45	2(A.5) 14	1455	500	95/95	700	.025
46	2A13	1459	2000	95/95	700	.02
47	2(0.5) 12	1504	1000	90/90	700	.02
48	2011	1508	500	90/310	1400	.05
49	1(0.5) 10	1511	700	90/370	10,000	.13
Special	1(0.8) 9.4	1513	1000	90/670	100,000	.25
50	1A9	1515	1500	90/315	100,000	.045
51	1(A.5) 8	1519	1000	90/240	100,000	.04

TABLE D.2 (Cont'd.)

Report Number	Grid Position (Ref. Fig. A.2)	Time of Report (PST)	Absolute Altitude (Ft)	B-21 Meter Reading (Millivolts B.G./B.G. Cont.)	Rate Meter Reading (Counts/Min)	Geiger-Mueller Reading (Mr/Hr)
52	1B7	1524	500	90/255	100,000	.045
53	1(B.5) 6	1529	500	90/200	1000	.035
54	1C6	1532	1000	90/185	1010	.03
55	1C7	1535	1000	120/180	1000	.03
56	1C8	1539	500	120/200	4300	.04
57	1C9	1541	400	120/125	100,000	.055
58	1(B.6) 9.7	1544	500	120/540	100,000	.14
59	1B11	1551	1000	120/270	1200	.05
60	1A13	1558	500	120/280	100,000	.07
61	1(0.5) 14	1603	1000	120/420	100,000	.13
62	1015	1606	500	120/330	Inop.	.11
BADGER II			(M. S. L.)			
1	1B3	1245	10,000	200/400	360	.02
2	1B5	1256	4500	200/410	340	.02
3	1-B$\frac{1}{2}$-3$\frac{1}{2}$	1305	6700	200/400	-	.02
4	1C3	1310	5500	200/270	400	.01
5	1-C$\frac{1}{2}$-1-3/4	1315	6400	195/195	390	.01
6	4-D$\frac{1}{2}$-0	1320	6700	180/190	400	.02
7	4E1	1322	6000	180/180	400	.02
8	1E5$\frac{1}{2}$	1402	10,000	200/830	600	.02
9	1E8	1410	10,000	200/200	780	.02
10	1-D$\frac{1}{2}$-7	1425	10,000	200/1300	1100	.2
11	1D5	1439	4700	200/200	200	.02
12	1D$\frac{1}{2}$-3$\frac{1}{2}$	1446	5600	230/230	500	.02
13	1E$\frac{1}{2}$-2	1455	7500	200/200	500	.02
14	1E2	1458	7000	190/190	500	.01
15	1F0	1509	6200	180/180	500	.02
16	4G1	1515	7500	180/180	500	.02
WOODCHUCK I			(Absolute)			
1	401	1026	75			.03

TABLE D.2 (Cont'd.)

Report Number	Grid Position (Ref. Fig. A.2)	Time of Report (PST)	Absolute Altitude (Ft)	B-21 Meter Reading (Millivolts B.G./B.G. Cont.)	Rate Meter Reading (Counts/Min)	Geiger-Mueller Reading (Mr/Hr)
2	4B1	1033	20			.1
3	4B0	1041	10			.2
4	2A6	1109	60			.02
(2 May 1952)						
BADGER I						
1	2F5	0734	3300	75/75	1100	.03
2	2G3	0744	5400	95/95	1100	.03
3	3G43	0806	2700	80/80	1000	.02
4	3F5	0816	2300	83/83	800	.03
5	3C5	0829	500	100/100	800	.03
6	3B7	0837	700	95/95	1000	.03
7	3B8	0840	900	95/95	1000	.03
8	3C8	0850	2000	95/95	1000	.03
9	4B6	0900	4200	130/130	1000	.03
10	4D8	0911	6400	100/100	1000	.03
11	4G5	0929	6200	100/100	1000	.03
12	1G3	0945	7000	100/100	1000	.03
13	1C½ 7	1018	6500			.03
14	1C½ 9	1027	7100			.04
15	1A9	1038	4000			.055
16	1C8	1044	3700			.045
17	2A8	1049	700			.04
18	2E5	1112	4800			.03
BADGER II						
1	2C2	0746	4000	150/150	100	0.0
2	2C0	0852	4000	150/150	80	0.0
3	2E0	0805	4000	150/150	40	0.0
4	3E2	0813	3500	150/150	80	0.0
5	3D2	0818	3000	145/145	80	0.0

TABLE D.2 (Cont'd.)

Report Number	Grid Position (Ref. Fig. A.2)	Time of Report (PST)	Absolute Altitude (Ft)	B-21 Meter Reading (Millivolts B.G./B.G. Cont.)	Rate Meter Reading (Counts/Min)	Geiger-Mueller Reading (Mr/Hr)
6	3D3	0820	3500	150/150	80	0.0
7	3C3	0824	3500	150/150	80	0.0
8	3C5	0833	4000	150/150	80	0.0
9	3A5	0839	6000	150/150	80	0.0
10	3A6	0841	6000	150/150	80	0.0
11	4A6	0850	4500	150/150	80	0.0
12	4C4	0902	6000	165/165	80	0.0
13	1D1	0922	6000	170/170	80	0.0
14	1C3	0933	5000	170/170	80	.1
15	1C5	0941	6500	160/160	80	0.0
16	2A5	0957	6500	160/160	80	.1
17	2B4	1001	6000	160/160	80	0.0
18	2C4	1004	4500	160/160	80	.1
19	2C3	1006	4500	150/150	80	.1
20	2C2	1009	4500	140/140	80	.1

TABLE D.3

Aerial Cloud Trackers Report - (Hounddog II and IV) - **Shot 4** - 1 May 1952 (See Fig. A.2)
(Code: Hounddog - B-29 aircraft).

Report Number	Grid Position (Ref.Fig. A.2)	Time of Report (PST)	Mean Sea Level Altitude (Ft)	B-21 Meter Reading (Millivolts B.G./B.G.Cont.)	Rate Meter Reading (Counts/Min)	Geiger Mueller Reading (Mr/Hr)
HOUNDDOG II						
1	2A8	1020	23,000			0.7
2	1C9	1037	23,000			13.0
3	2C9	1045	23,000			10.0
4	2A15	1100	23,000			1.5
5	2A16	1115	22,000			1.0
6	1A10	1130	22,000			21
7	2C9	1150	19,000			80
8	2B7	1205	19,000			0.5
9	1C9	1220	19,000			4
10	2B14	1237	19,000			3
11	1A13	1255	17,000			6
12	2A9	1320	17,000			0.5
13	1B11	1335	17,000			4
HOUNDDOG IV						
1	4A1	0903	7,500			.2
2	1B0	0920	8,500			.4
3	2A2	0932	12,000			.5
4	1A4	0944	11,500			3.0
5	1A1	1001	8,000			
6	2C4	1013	9,500			.03
7	1C6	1033	10,000			.5
8	1B5	1050	6,500			.3
9	1C4	1102	7,000			3.0

TABLE D.3 (Cont'd.)

Hounddog II (B-29) - 1 May 1952

Double Drift Altitude m.s.l.	Wind Direction/Speed	Time (Closest 5 Min.)
13,000'	257°/15 knots	0905
15,000'	276°/20 knots	0915
17,000'	276°/18 knots	0925
19,000'	275°/24 knots	0935
21,000'	280°/28 knots	0945
23,000'	278°/28 knots	0955
24,000'	274°/27 knots	1010

ADDITIONAL REMARKS

A3 - Rosie 2 Dog 30 Separated. Rosie 2 Dog 23 Stratified to Dog 17

A6 - Dog 30 Rosie 2 Drift S-SE. Dog 22-24 Rosie 2 Drift S-SW.

Able 10 Rosie 3 apparently topping mountains from 2C7 to 2C10. Appears as heavy diffuse light brown cloud.

Rosie 2, 1250, D-19. Appears as light wispy fingers laying on a line from NW to SE. Fingers and projections at times lay in a Westerly-Easterly direction.

Rosie 2, 1310, D-17. Bulk of Rosie 2 lies from 2A10 to 1E15

1335. Twin engine aircraft on Amber 2, NE bound at approx. 12,000'. (0910)

Two MK-5 probes were placed against the plexiglass nose of the B-29. These probes were placed on either side of the nose instrument panel against the plexiglass nose panels.

TABLE D.4

Fixed Air Sampling and Fall-out Tray Report - Shot 5 - 1 May 1952

CODE	STATION	AIR CONCENTRATION IN $\mu c/m^3$ (Hi-Vol) 24 Hrs.	Total Vol.	FALL-OUT TIME AFTER H-HOUR	FALL-OUT TRAYS d/m	Part/Tray	μc/Part	PARTICLE SIZE MMD	% < 5 μ	BACKGROUND RECORDER Arrival Time	High Reading (Mr/Hr)
CP	CP	33×10^{-6}	33.7×10^{-6}	(1 & 10)	11,040	2	1.7×10^{-3}	-	-	-	-
M	MERCURY	4.5×10^{-6}	4.34×10^{-6}	(2)	3,750	2	$.5 \times 10^{-3}$	-	-	-	-
IS	INDIAN SPGS	35.9×10^{-6}	35.9×10^{-6}	(10)	4,467	33	$.04 \times 10^{-3}$	-	-	-	Bkg.
NE	NELLIS AFB	9.57×10^{-6}	9.57×10^{-6}	(10)	1,057	7	$.05 \times 10^{-3}$	-	-	-	Bkg.
LV	LAS VEGAS	9.33×10^{-6}	9.33×10^{-6}	(10)	2,440	9	$.03 \times 10^{-3}$	-	-	-	Bkg.
GJ	GLENDALE JCT	39.3×10^{-6}	39.3×10^{-6}	(10)	9,975	2	1.5×10^{-3}	-	-	-	-
CH	CHARLESTON PK	$< 10^{-6}$	$< 10^{-6}$	—	—	-	—	-	-	-	Bkg.
AL	ALAMO	417×10^{-6}	380×10^{-6}	(4)	829,000	1943	$.13 \times 10^{-3}$	-	-	-	-
LM	LINCOLN MINE	12.0×10^{-6}	12.0×10^{-6}	(4)	4,410	12	$.11 \times 10^{-3}$	-	-	-	Bkg.
CA	CALIENTE	447×10^{-6}	447×10^{-6}	(9)	216,700	1268	$.05 \times 10^{-3}$	0.6	35	-	-
CS	CRYSTAL SPGS	26.4×10^{-6}	25.8×10^{-6}	(10)	26,800	301	$.02 \times 10^{-3}$	-	-	-	-
GM	GROOM MINE	393×10^{-6}	393×10^{-6}	2	2,440,000	3872	$.19 \times 10^{-3}$	1.5	60	1135	0.8
PI	PIOCHE	850×10^{-6}	860×10^{-6}	8	86,300	627	$.04 \times 10^{-3}$	-	-	-	-
WS	WARM SPRINGS	2.03×10^{-6}	2.03×10^{-6}	(3)	—	4	—	-	-	-	Bkg.
TO	TONOPAH	$< 10^{-6}$	$< 10^{-6}$	(4)	—	5	—	-	-	-	Bkg.
BE	BEATTY	31.3×10^{-6}	31.3×10^{-6}	(6)	5,160	7	—	-	-	-	Bkg.
CU	CURRANT	14.1×10^{-6}	14.1×10^{-6}	(10)	17,100	8	$.64 \times 10^{-3}$	-	-	-	Bkg.
EL	ELY	14.9×10^{-6}	14.0×10^{-6}	(10)	19,050	40	$.14 \times 10^{-3}$	-	-	Broken	

TABLE D.5

Weather Data - (Rawin Readings Taken at CP) - Shot 4 1 May 52

Time (PST)	Altitude in Ft. m.s.l.	Direction in Degrees	Speed in Knots
0500	Surface	40	6
	4,000	100	6
	5,000	180	3
	6,000	180	4
	9,000	0	0
	10,000	250	2
	11,000	280	7
	12,000	280	10
	13,000	270	15
	14,000	270	17
	15,000	270	18
	16,000	280	17
	17,000	290	17
	18,000	290	20
	19,000	290	23
	20,000	290	27
	21,000	290	30
	22,000	290	28
	23,000	280	24
	24,000	270	22
	25,000	270	23
	26,000	260	28
	27,000	260	30
	28,000	260	26
	29,000	260	40
	30,000	260	45
	35,000	270	48
	40,000	270	50
	45,000	280	47
	47,000	280	44

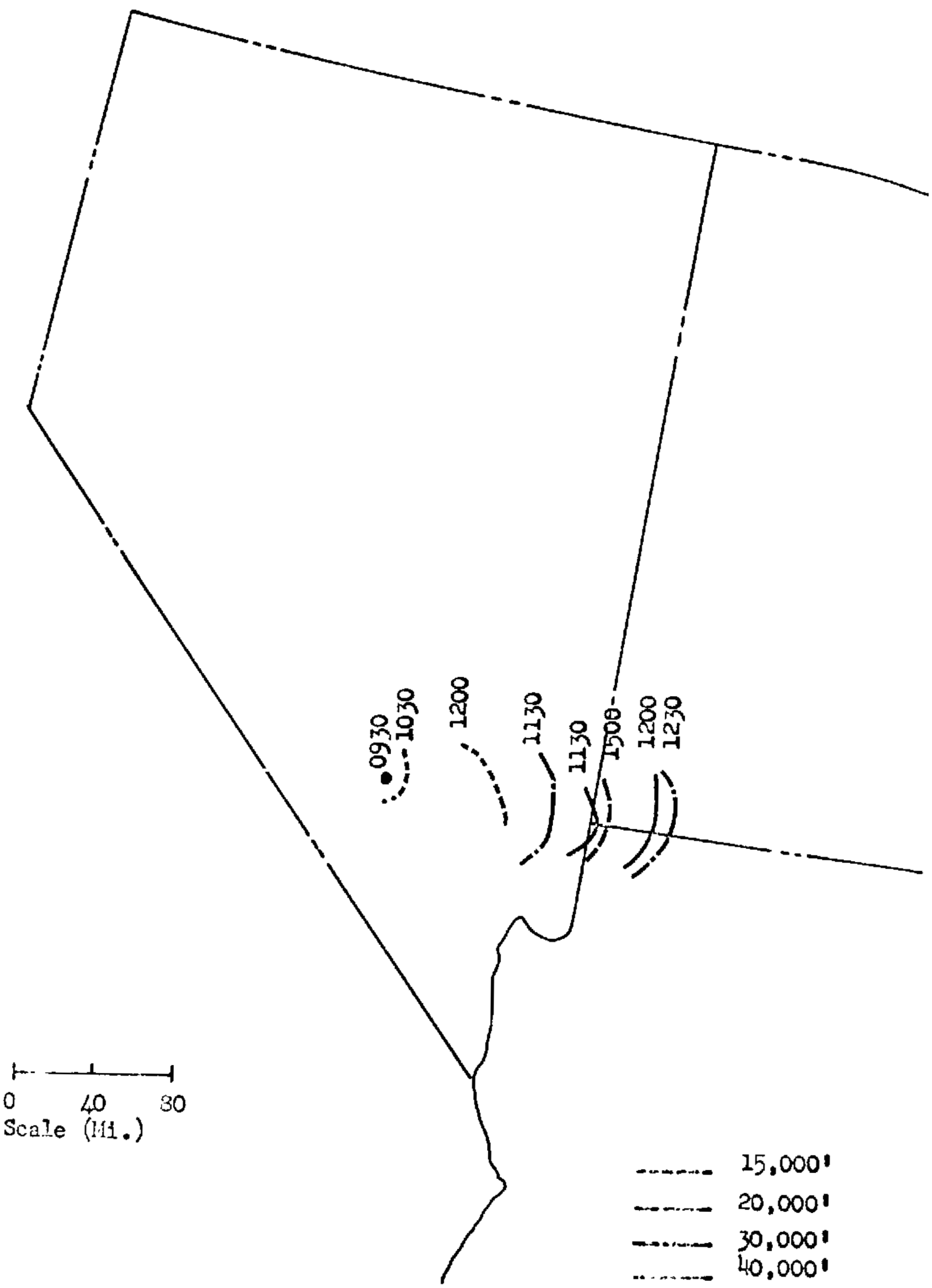


Fig. D.1 Cloud Progression, Shot 4

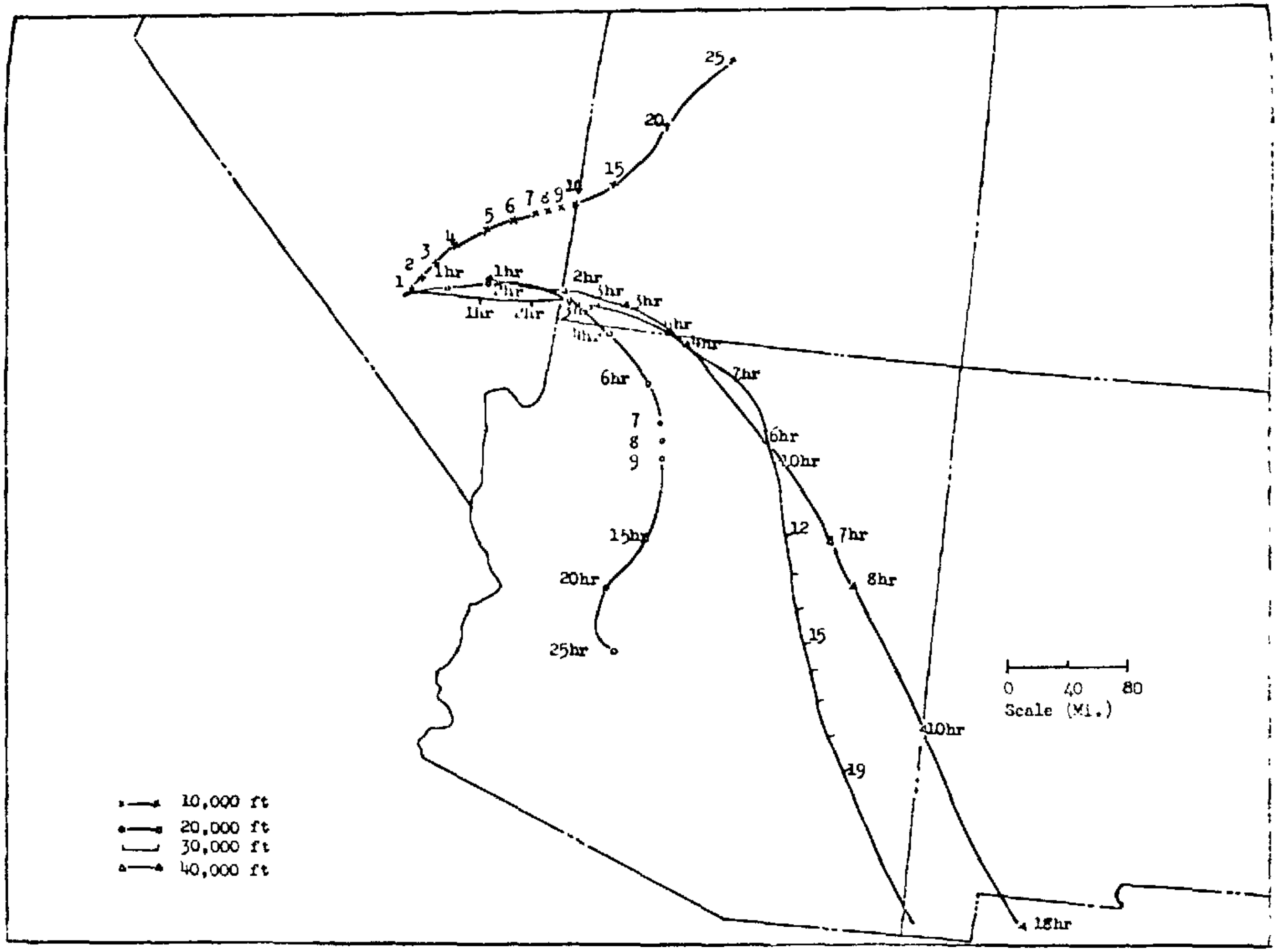


Fig. D.2 Cloud Trajectory, Shot 4

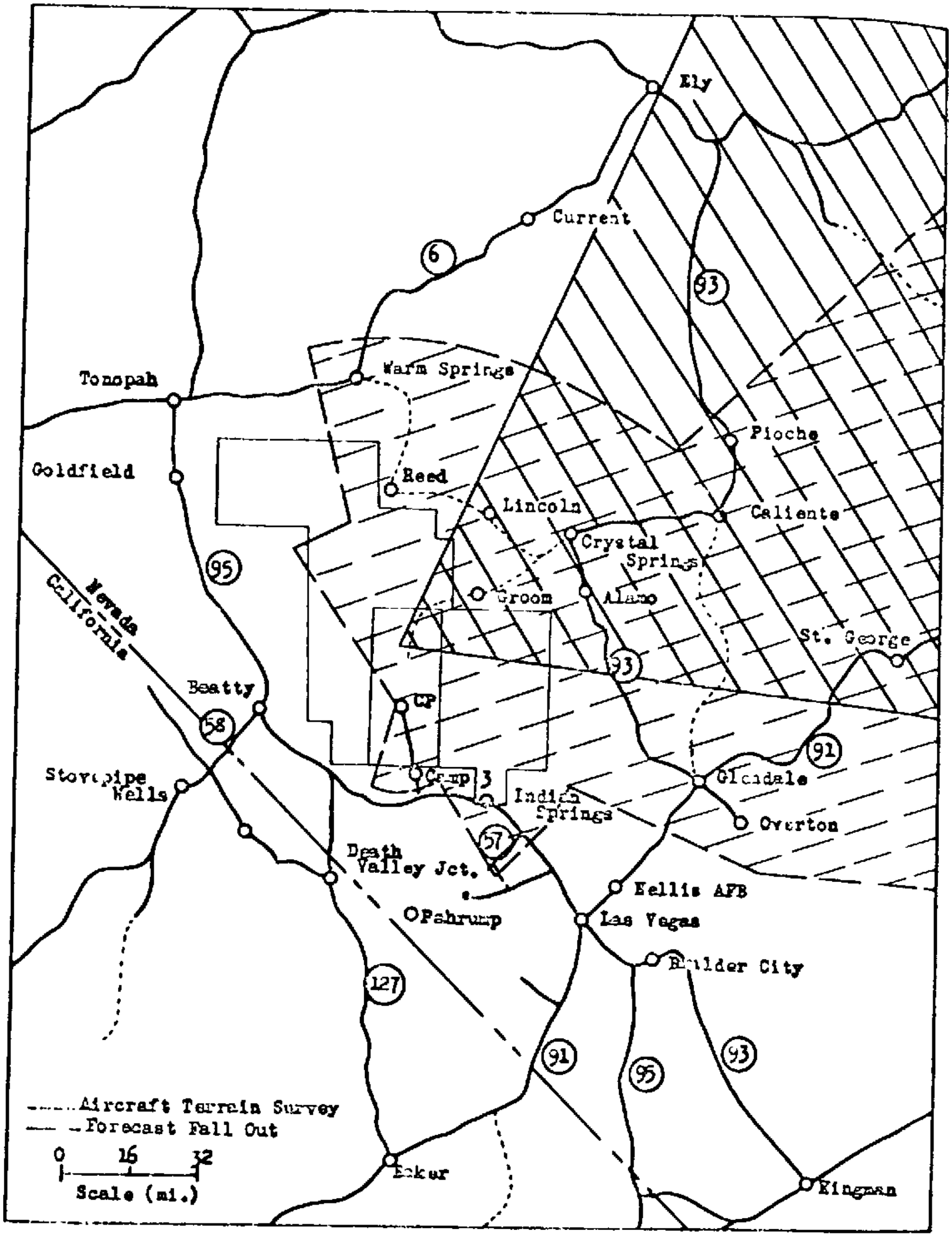
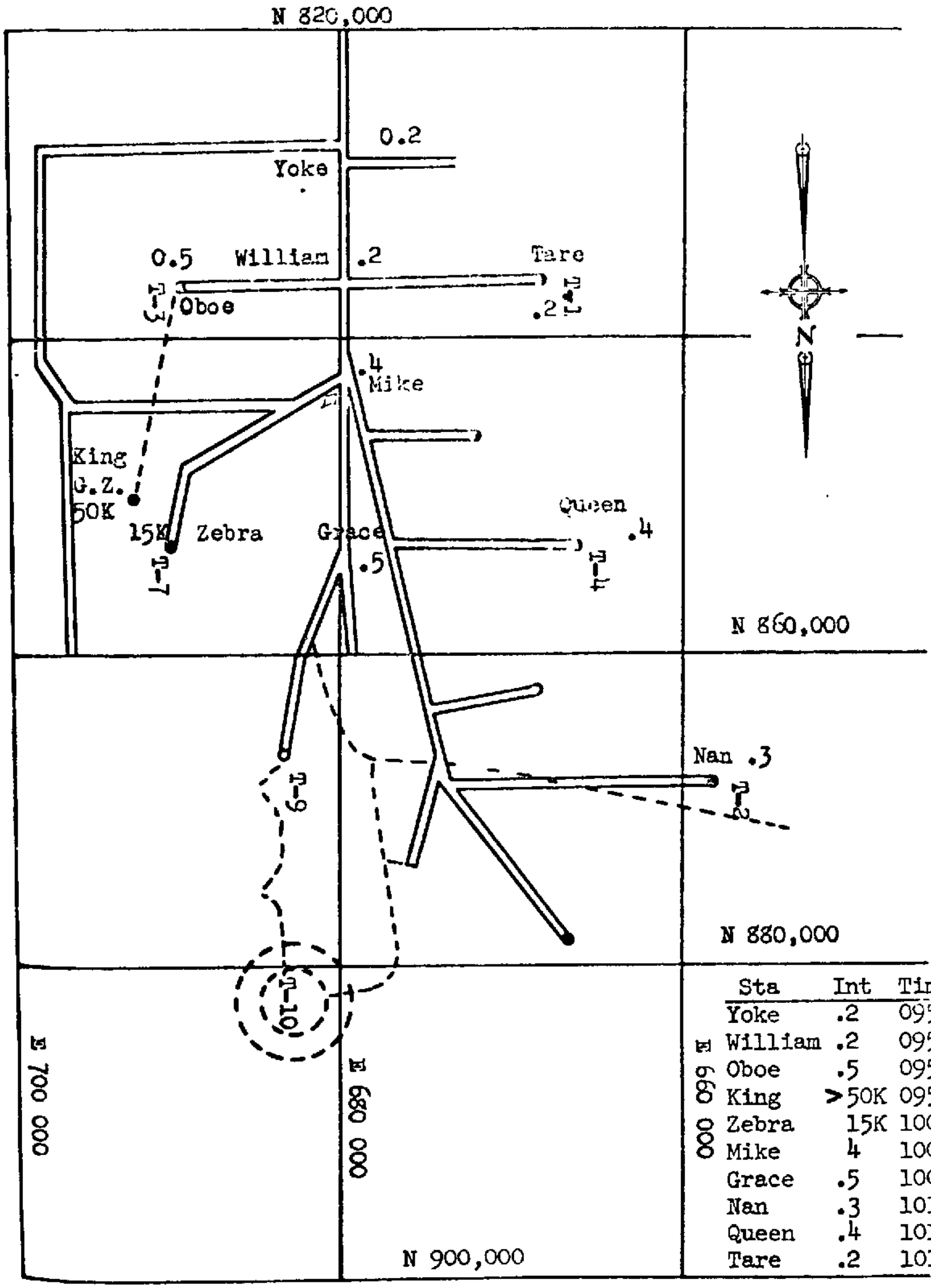


Fig. D.3 Fall-out Forecast and Area Covered by Surveys, Shot 4



Sta	Int	Time
Yoke	.2	0950
William	.2	0955
Oboe	.5	0958
King	>50K	0959
Zebra	15K	1002
Mike	4	1000
Grace	.5	1005
Nan	.3	1010
Queen	.4	1015
Tare	.2	1019

King=50K at 200' from G.Z.

20' above Terrain

Fig. D.4 Initial Survey by Helicopter, Shot 4

TABLE D.6

Monitors' Survey Report - **Shot** 4 - 1 May 1952

Stake No.	INTENSITY 1 May 1952 Mr/Hr	Time	1 May 1952 Mr/Hr	Time	2 May 1952 Mr/Hr	Time	3 May 1952 Mr/Hr	Time	4 May 1952 Mr/Hr	Time	5 May 1952 Mr/Hr	Time
GZ									3800	0453		
1							10000	0456	3400	0452	1/R	0511
2									1200	0450	500	0511
3									600	0449	450	0510
4							2400	0452	260	0448	300	0505
5							800	0451	145	0447	200	0505
6	15,000	0922	9000				320	0449	75	0446	90	0500
7	6,000	0921	4000		700	0520	160	0448	36	0445	28	0500
8	2,800	0920	2000		320		90	0445	26	0444	10	0458
9	900	0919	750		165	0519	50	0443	18	0443	4.4	0458
10	350	0918	260		85		32	0442	10	0442	3.2	0456
11	200	0917	140	Afternoon Survey	50	0518	18	0441	6	0441	1.8	0455
12	95	0916	100		28		10	0439	3	0441	1	0455
13	50	0915	40		16	0517	6	0437	2	0440		
14	38	0928	24		10.0		5	0436	1	0440		
15	20	0927	140		8.0	0516	4	0434				
16	10	0926	8.0		3.2		3	0432				
17	5.0	0925	4.0		2.2		1	0430				
18	4.4	0924	3.5		1.8	0512						
19	2.4	0923	2		1							
20					0.7	0511						
21					0.5							
22					0.4	0510						
23					0.2							
24					0	0509						
25					0							
26					0	0507						
27					0							
[illegible]					0							

TABLE D.6 (Cont'd.)

Stake No.	INTENSITY 1 May 1952 Mr/Hr	Time	1 May 1952 Mr/Hr	Time	2 May 1952 Mr/Hr	Time	3 May 1952 Mr/Hr	Time	4 May 1952 Mr/Hr	Time	5 May 1952 Mr/Hr	Time
29					0							
30					0.0							
31									3500	0456	1/R	0511
32									1300	0457	500	0512
33									650	0458	400	0512
34							1000	0458	300	0500	350	0515
35	10,000	0929							150	0501	120	0515
36									80	0502	90	0516
37	2,400	0930	1500		600	0539			42	0504	20	0516
38	1,400	0931	900		370	0540	120	0500	30	0505	11	0517
39	650	0932	480		180	0541	60	0504	20	0506	2.4	0518
40	400	0933	260		100	0542	40	0506	12	0507	1.5	0518
41	220	0934	140		61	0543	22	0508	6	0508		
42	120	0935	90		32	0544	14	0510	3	0509		
43	80	0936	50		22	0545	10	0515	2	0510		
44	41	0937	30		14	0547			1	0511		
45	24	0938	16		10	0549						
46	10	0939	10		7	0550						
47	6	0940	6		5	0551						
48	5	0941	4		2	0552						
49			2		1							
50					0.8	0553						
51					.6	0554						
61											490	0503
62									1000	0509	308	0502
63							1R	0504	775	0508	190	0501
64	10,000	0937					3R	0500	425	0507	100	0501
65							500	0448	220	0506	32	0500
66	4,500	0935			800	0514	260	0457	110	0505	11	0459

TABLE D.6 (Cont'd.)

Stake No.	INTENSITY 1 May 1952 Mr/Hr	Time	1 May 1952 Mr/Hr	Time	2 May 1952 Mr/Hr	Time	3 May 1952 Mr/Hr	Time	4 May 1952 Mr/Hr	Time	5 May 1952 Mr/Hr	Time
67	2,000	0933	1400	1229	400	0512	150	0456	40	0504	3.4	0458
68	1,250	0932	950	1227	280	0511	100	0455	32	0503	2.8	0458
69	700	0931	450	1226	160	0510	50	0453	18	0502		
70	490	0928	260	1225	100	0509	30	0452	10	0501		
71	405	0927	150	1220	44	0508	10.6	0451	5	0500		
72	120	0926	90	1219	28	0506	10	0456				
73	75	0925	46	1218	16	0505	5	0445				
74	39	0924	28	1216	10	0503						
75	23	0923	16	1215	6	0502						
76	13	0922	10	1214								
77	5.8	0921	6	1213								
78	5	0920	3.4	1211								
79	3	0920	2	1210								
80	1.8	0918										
81	1.2	0917										
82	1	0916										
83	.8	0915										
91									1000	0515	320	0511
92									820	0516	183	0512
93									420	0517	90	0512
94									240	0518	29	0513
95	10,000	0944					1R	0507	110	0519	12	0514
96	3,300	0943			300	0531	3R	0508	60	0520	7.8	0515
97	2,000	0942	1100	1240	360	0530	1R	0509	34	0525	3.4	0516
98	1,000	0941	650	1238	220	0529	150	0510	22	0526	2.2	0517
99	430	0940	340	1244	120	0528	100	0511	12	0527	1.7	0518
100	280	0945	190	1244	80	0527	60	0512	8	0528		
101	160	0946	120	1245	30	0526	20	0514	4	0529		

TABLE D.6 (Cont'd.)

Stake No.	INTENSITY 1 May 1952 Mr/Hr	1 May 1952 Time	1 May 1952 Mr/Hr	1 May 1952 Time	2 May 1952 Mr/Hr	2 May 1952 Time	3 May 1952 Mr/Hr	3 May 1952 Time	4 May 1952 Mr/Hr	4 May 1952 Time	5 May 1952 Mr/Hr	5 May 1952 Time
102	100	0942	65	1246	20	0525	12	0515				
103	42	0949	31	1244	10	0523	10	0516				
104	24	0950	18	1249	6	0522	5	0517				
105	15	0957	11	1253								
106	7	0951	6	1254								
107	6	0952	3.4	1255								
108	3.2	0953	2.3	1255								
109	2.2	0955	1.4	1256								
110	1.2	0956										
111	.8	0957										
112	.4	0958										
113	.3	0959										
121											1000	0525
122											600	0526
123	10R	1000					1000	0455			220	0527
124							100	0455			100	0528
125							330	0456			60	0529
126							220	0457			16	0530
127	1R	1005	1600	1254			138	0458			12	0531
128			600	1253	140	0609	65	0459			7	0532
129			235	1249	85	0605	35	0500			3	0533
130	210	1008	120	1245	46	0602	20	0502				
131	100	1010	75	1244	28	0600	12	0502				
132	60	1011	44	1244	16	0542	8	0503				
133	50	1012	24	1243	8	0532	5	0504				
134	22	1014	14	1242	6	0528						
135	1.2	1015	10	1240	3	0520						
136	8	1017	7.5	1237	2	0514						

TABLE D.6 (Cont'd.)

Stake No.	INTENSITY 1 May 1952 Mr/Hr	Time	1 May 1952 Mr/Hr	Time	2 May 1952 Mr/Hr	Time	3 May 1952 Mr/Hr	Time	4 May 1952 Mr/Hr	Time	5 May 1952 Mr/Hr	Time
137	9	1018	4.4	1236								
138	7	1019	3.2	1236								
139	6	1020	2.5	1235								
140	5.5	1021	1.8	1235								
141	2.4	1023	1.4	1233								
142	1.8	1024	1.2	1232								
143	1.6	1025	1.2	1232								
144	1.4	1026	1	1231								
145	1.5	1027	1	1231								
146	1.8	1028	.9	1230								
147	1.2	1029	.8	1230								
148	1.4	1030										
151											1000	0524
152							1000	0451			600	0523
153	10R	0955					600	0450	1R	0540	300	0622
154	7R	0954					345	0449	430	0546	110	0521
155	2040	0953					220	0449	170	0545	60	0520
156	1020	0952	1000	1305	1000	0510	138	0448	100	0544	22	0519
157	750	0950	650	1307	820	0514	96	0448	29	0543	10	0518
158	600	0949	400	1308	120	0512	65	0447	20	0542	7	0517
159	240	0948	230	1308	100	0612	39	0447	11	0541	5	0516
160	180	0947	100	1310	800	0615	26	0446	5	0540		
161	100	0946	40	1313	700	0618	14	0446				
162	40	0945	42	1314	20	0620	9	0445				
163	36	0943	22	1315	12	0623	4.6					
164	20	0941	10	1316								
165	10	0940	9	1316								
166	7.5	0938	4.8	1317								
167	6	0937	3.4	1318								

TABLE D.6 (Cont'd.)

Stake No.	INTENSITY 1 May 1952 Mr/Hr	Time	1 May 1952 Mr/Hr	Time	2 May 1952 Mr/Hr	Time	3 May 1952 Mr/Hr	Time	4 May 1952 Mr/Hr	Time	5 May 1952 Mr/Hr	Time
167	6	0937	3.4	1318								
168	3.7	0936	2	1318								
169	2.6	0935	1.2	1319								
170	2	0934	.7	1320								
171	2.2	0932	.4	1320								
172	2	0931	.2	1321								
173	2.2	0930	.4	1321								
174	2.3	0929	.4	1323								
175	3	0928	.8	1324								
176	3.4	0925	.8	1327								
177	4.5	0922	.9	1329								
178	4.5	0920	1	1330								
180			1.3	1333								
181											1000	0504
182											900	0505
183							1000	0524	1R	0534	400	0506
184	10,000	1038					600	0523	800	0533	160	0507
185	6,000	1039			1400	0511	270	0522	270	0532	60	0508
186	2,800	1040			1000	0512	180	0522	100	0531	22	0509
187	1,600	1041	1000	1239	800	0513	105	0521	47	0530	12	0510
188	850	1042	800	1240	280	0514	65	0520	22	0529	6	0511
189	400	1043	500	1241	150	0515	46	0519	12	0528	3	0512
190	300	1044	230	1242	80	0516	26	0519	7	0527		
191	180	1045	140	1243	75	0517	18	0518	5	0525		
192	100	1046	100	1244	40	0518	10	0517				
193	50	1047	54	1245	14	0519	4.8	0516				
194	33	1048	40	1246	10	0520						
195	16	1056	15	1247	5	0521						
196	10	1051	10	1248								

TABLE D.6 (Cont'd.)

Stake No.	INTENSITY											
	1 May 1952		1 May 1952		2 May 1952		3 May 1952		4 May 1952		5 May 1952	
	Mr/Hr	Time	Mr/Hr	Time	Mr/Hr	Time	Mr/Hr	Time	Mr/Hr	Time	Mr/Hr	Time
197	7	1052	6	1249								
198	5	1053	3	1250								
199	2	1054										
211											1000	0503
212											900	0502
213							1000	0526			500	0501
214							580	0527			240	0500
215	10,000	1046					360	0528			100	0459
216	5,000	1045			1000	0509	280	0528			50	0457
217	2,200	1044			600	0508	200	0529			16	0455
218	1,200	1043	1000	1237	320	0507	100	0530			10	0454
219	600	1042	600	1236	180	0506	65	0531			5	0453
220	383	1041	300	1235	100	0505	33	0531				
221	215	1040	145	1231	46	0504	20	0534				
222	135	1038	72	1230	27	0503	12	0534				
223	85	1037	45	1229	16	0502	8	0535				
224	48	1036	31	1228	7	0501	5	0536				
225	29	1035	19	1226	4	0500						
226	18	1034	12	1223								
227	11	1033	7	1222								
228	7	1032	3.6	1221								
229	2.4	1031	2	1220								
230	2	1036										

TABLE D.6 (Cont'd.)

INTENSITY 6 May 1952					
Stake No.	Mr/Hr	Time	Stake No.	Mr/Hr	Time
GZ	460	0507	121	320	
1	350	0540	122	110	
2	320	0542	123	40	
3	225	0543	124	12	
4	100	0545	125	6	
5	45	0548	126	2.4	
6	25	0550	127	1.7	0511
7	20	0552	128	1	0510
8	13	0554	151	190	0525
9	4	0557	152	90	0524
10	1	0559	153	32	0524
31	320	0526	154	17	0523
32	240	0528	155	8	0522
33	130	0524	156	5	0521
34	80	0530	157	3.6	0520
35	20	0532	158	2.4	0519
36	10	0534	159	1.2	0518
37	8	0535	181	300	0508
38	4	0537	182	140	0540
39	2	0538	183	90	0511
40	1	0540	184	20	0512
60	160	0506	185	9	0513
61	100	0505	186	4.2	0514
63	29	0503	187	2.5	0515
64	18	0502	188	1.1	0517
65	12	0501	211	220	
66	9	0500	212	200	
67	5	0458	213	180	
68	38	0455	214	140	
69	2	0456	215	90	
70	1.1	0455	216	35	
91	180	0530	217	20	
92	140	0531	218	9	
93	80	0532	219	4.4	
94	20	0534	220	2.2	
95	12	0535	221	1.8	
96	7	0536	222	1	
97	5	0537	348	100	
98	3	0538	349	44	
99	2	0539	350	38	
100	1	0540	351	18	

TABLE D.6 (Cont'd.)

Stake No.	Mr/Hr	Time	Stake No.	Mr/Hr	Time
		INTENSITY 6 May 1952			
352	10		355	2	
353	3		356	1	
354	2				

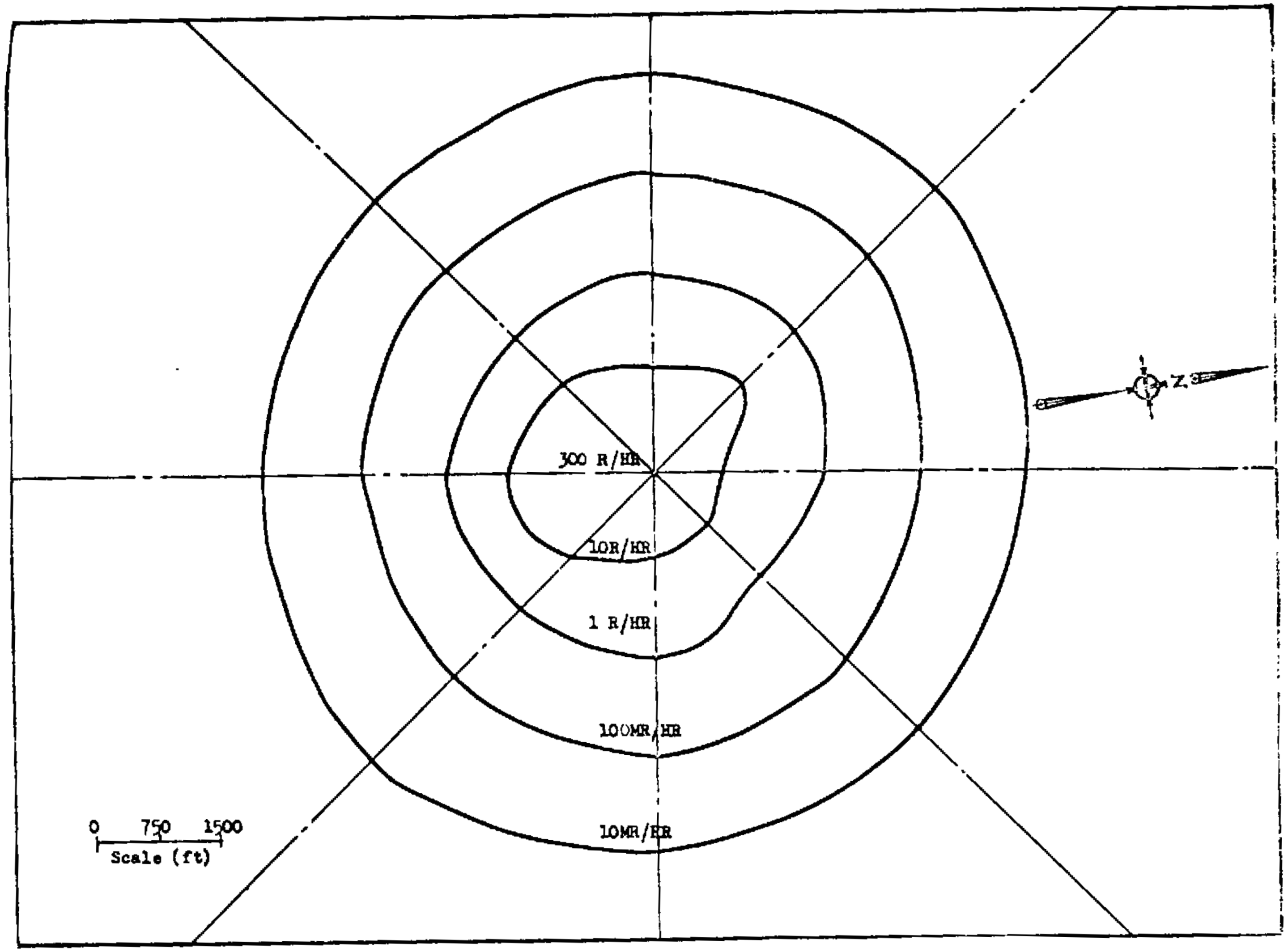


Fig. D.5 Isointensity Overlay, 0905-1005 PST (H-Hour 0829), Shot 4 (See Fig. D.4

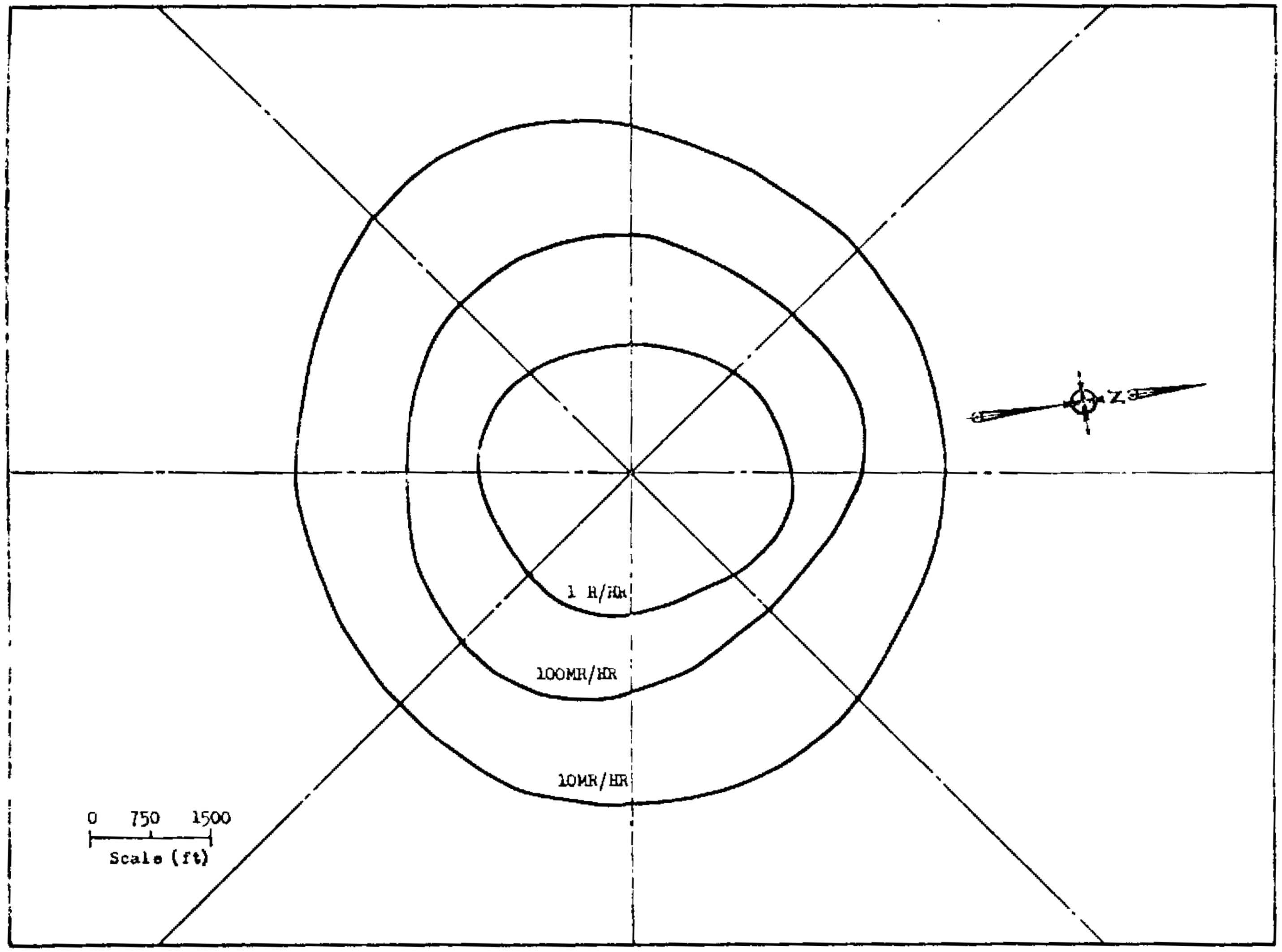


Fig. D.5.1 Isointensity Overlay, 0530, Shot 4 (See Fig. D.4)

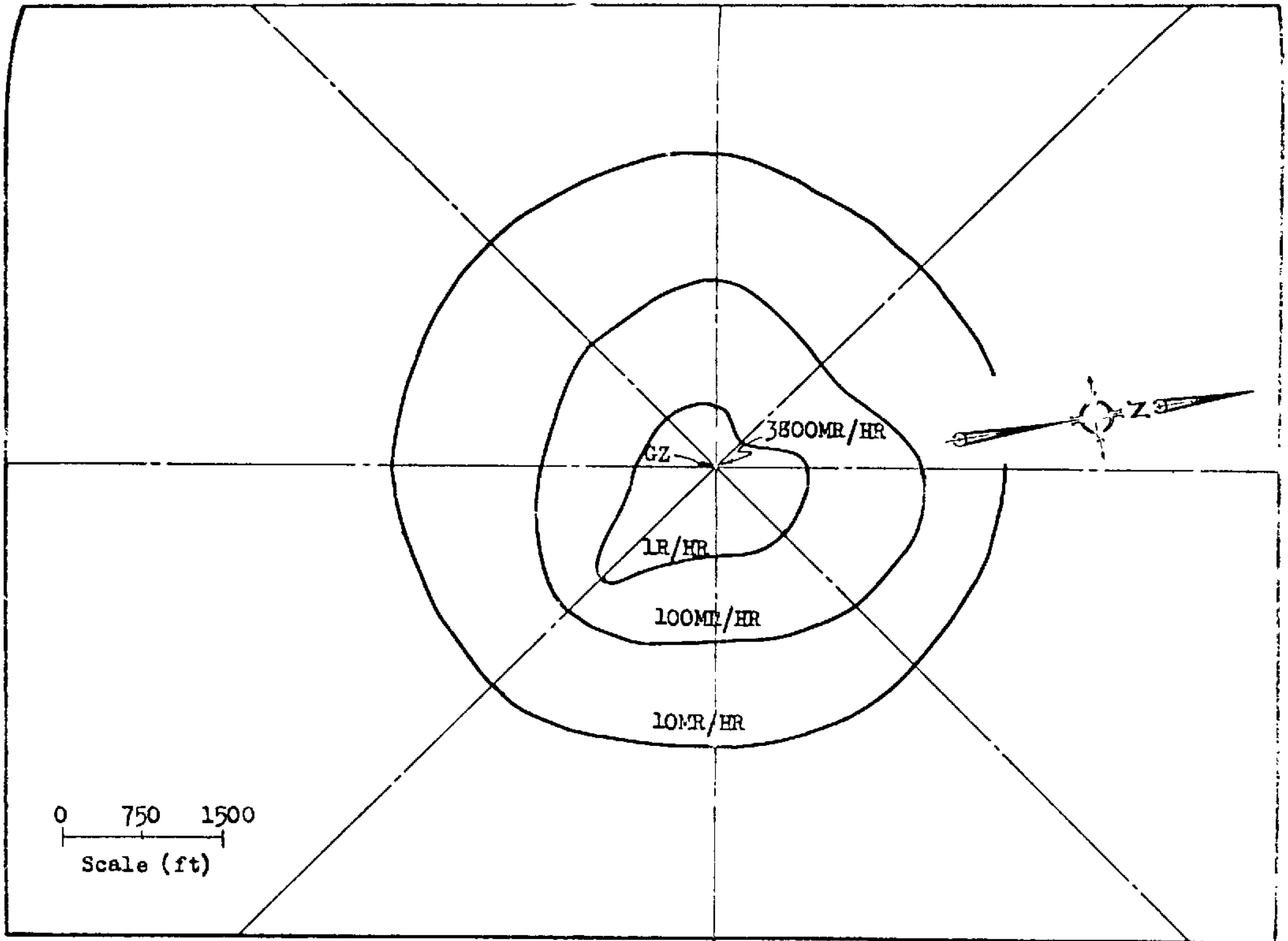


Fig. D.5.2 Isointensity Overlay, 0530, Shot 4 (See Fig. D.4)

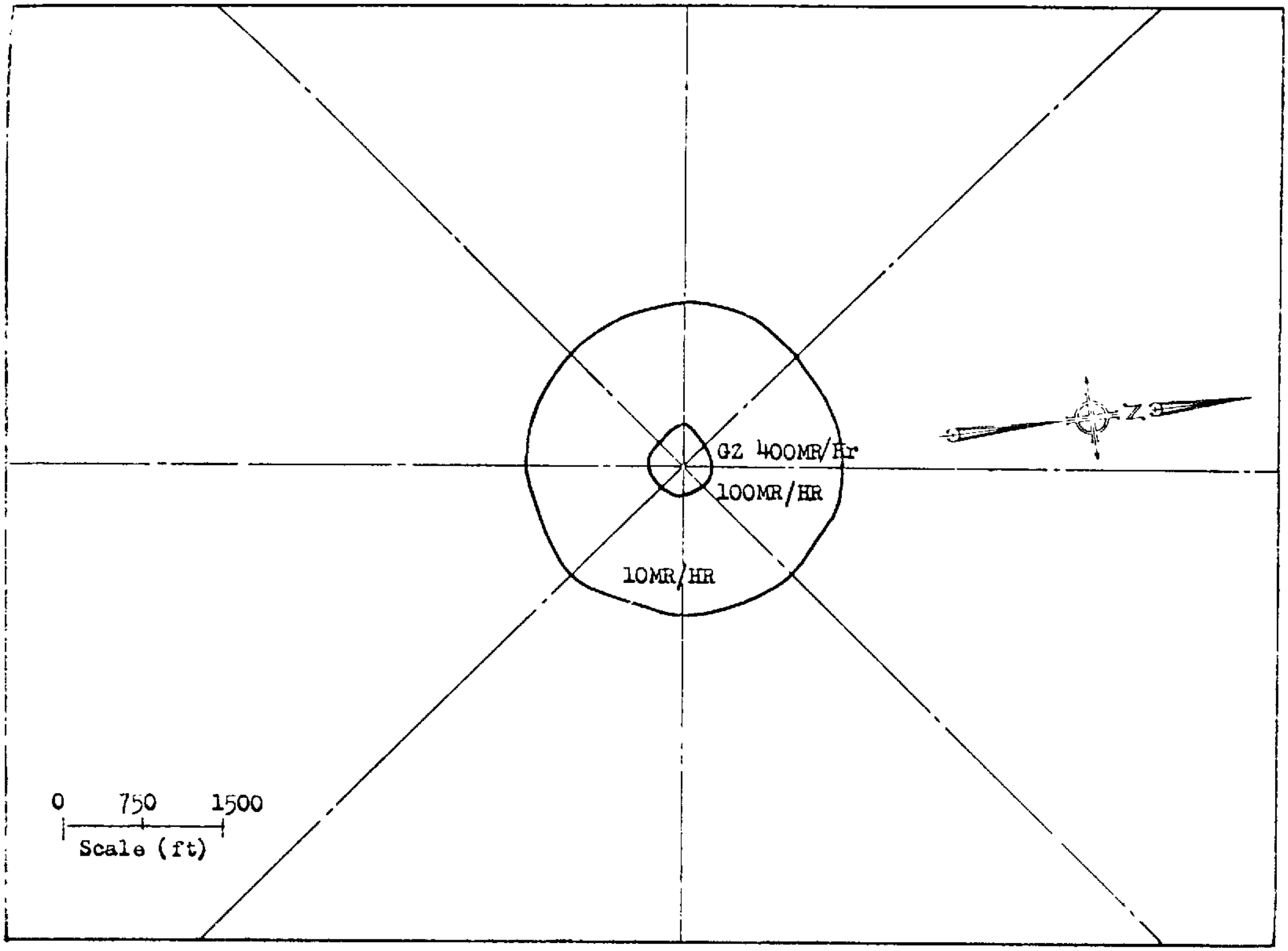


Fig. D.5.3 Isointensity Overlay, 0730, Shot 4 (See Fig. D.4)

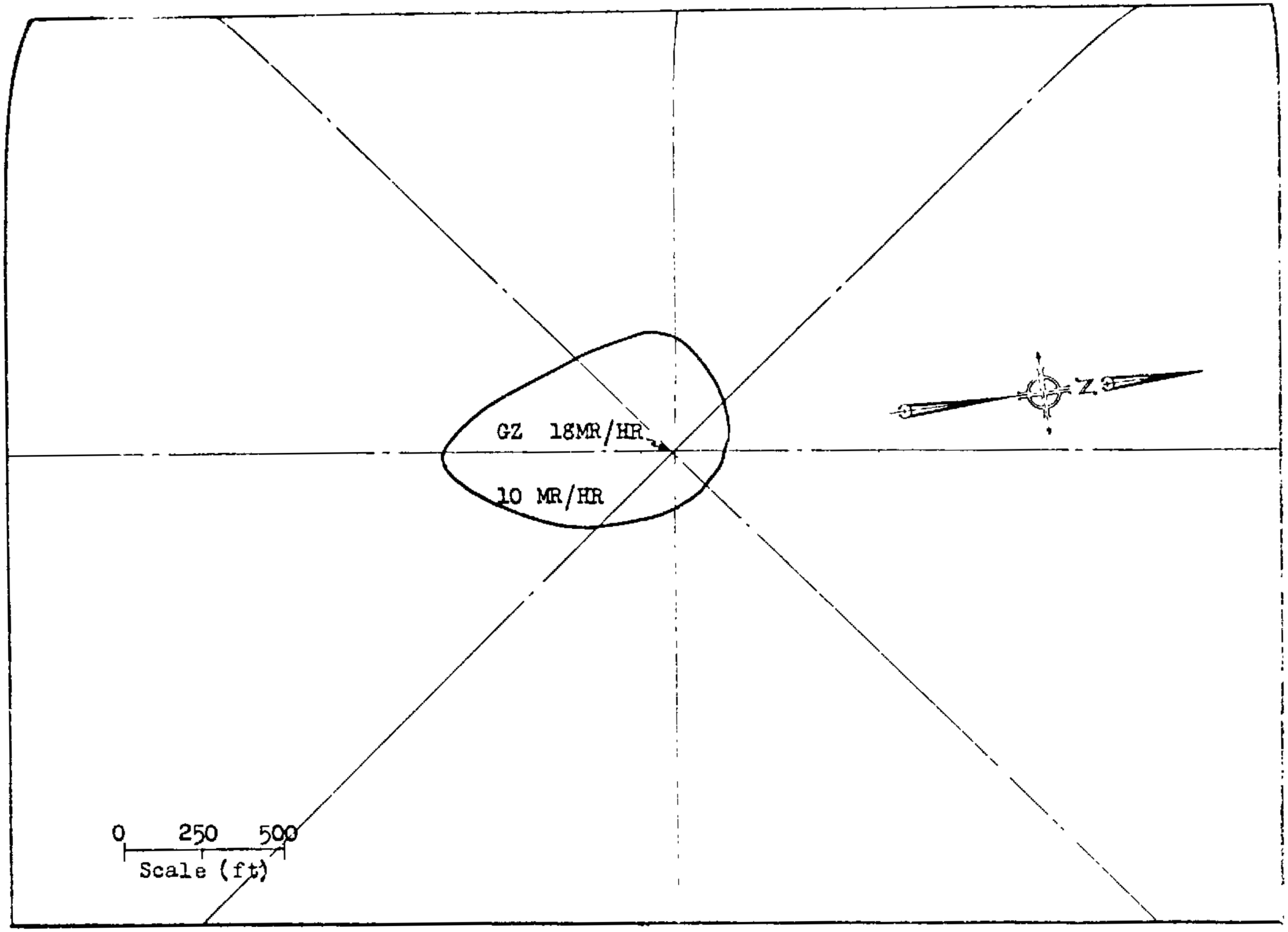


Fig. D.5.4 Isointensity Overlay, 0530, Shot 4 (See Fig. D.4)

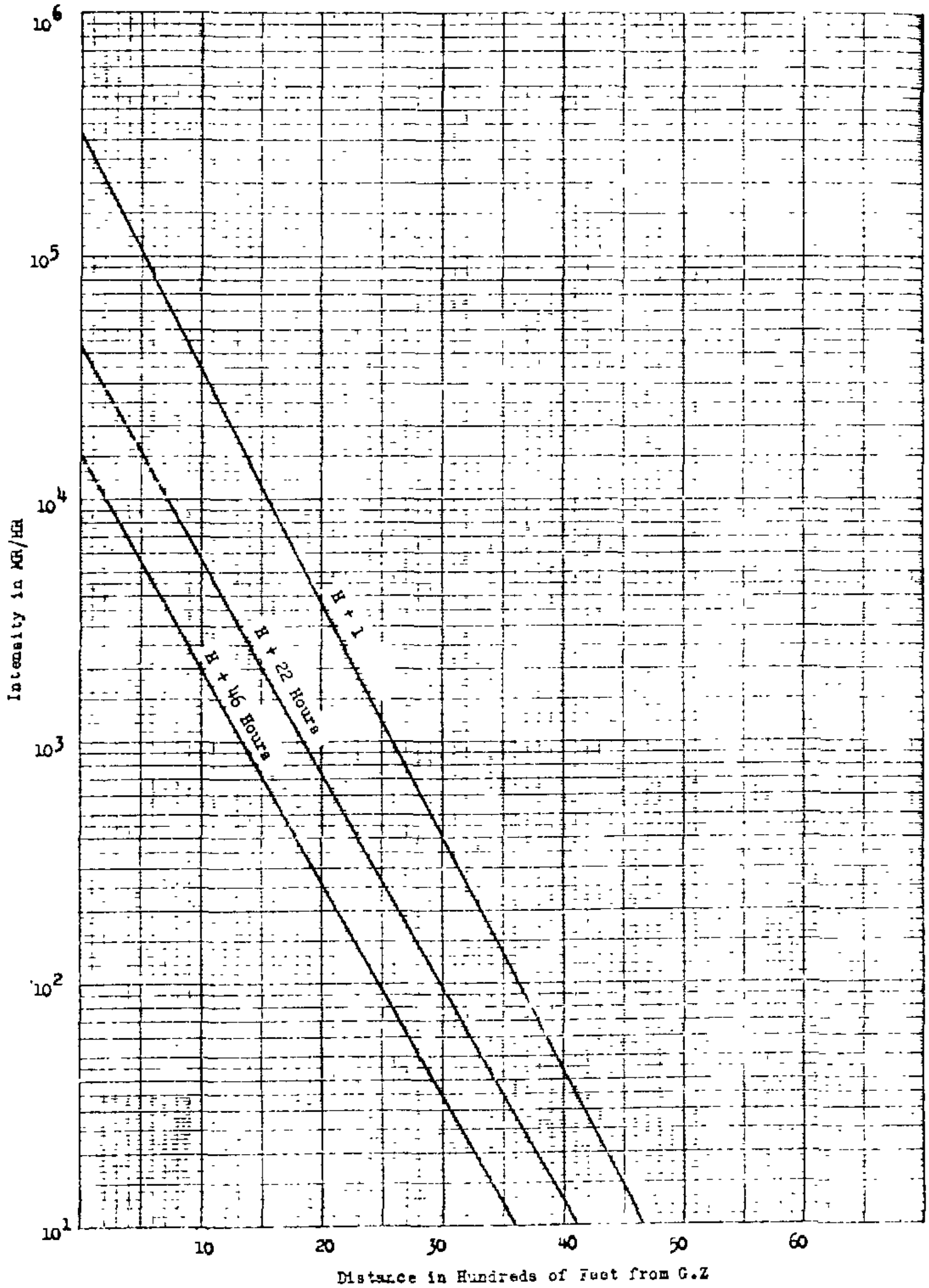


Fig. D.6 Ground Contamination (mr/hr) vs Distance from Ground Zero, 0730, Shot 4

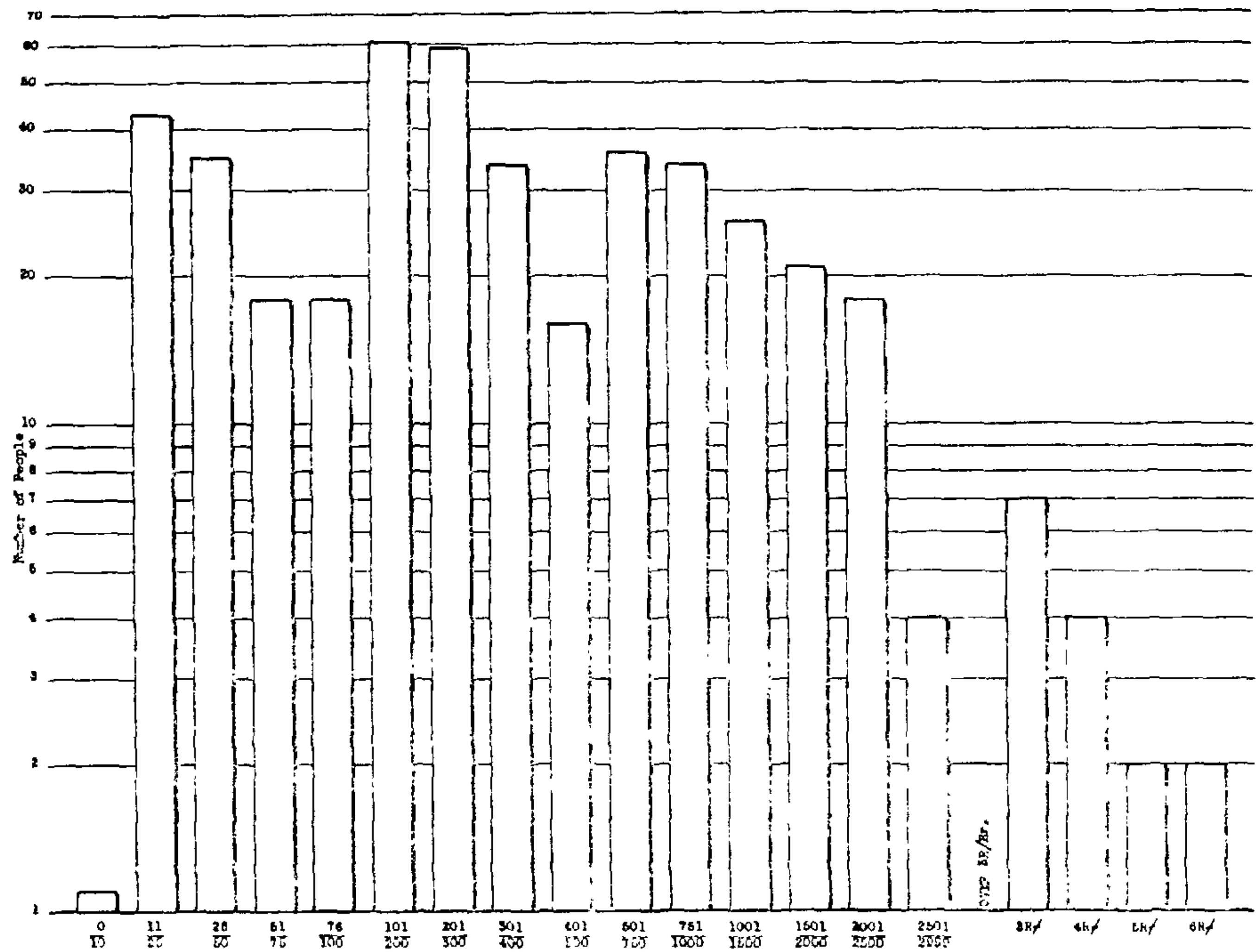


Fig. D.7 Accumulated Dose Report (For personnel issued film badges during period D to E-1 Days

APPENDIX E

OPERATION TUMBLER-SNAPPER
Shot 5 - 7 May 1952
(Period Covered: 7 May-24 May 1952)

OPERATIONAL DATA

Location: T-1 Area
Height of Burst: 300 ft
Yield (KT): 11.8
Time Fired: 0415 (PST)

OPERATION TUMBLER-SNAPPER
Shot 5 - 7 May 1952

E.1 OFF-SITE OPERATIONS DEPARTMENT

A [redacted] weapon was detonated in the T-1 Area on a 300-foot tower at 0415, 7 May 1952. This was the first tower shot of the TUMBLER-SNAPPER Series, and the results indicate very forcibly the problems of fall-out in areas of from 20 to 100 miles from the test site. The intensity readings as measured by the ground mobile monitors in the northeast quadrant ran up to a maximum of 1200 mr/hr two hours after shot time. As each intensity was reported, the integrated dose was computed for this location and posted on the Off-Site Radiological Situation Map. Lincoln Mine, which is approximately 45 miles northeast of NPG, received a maximum of 100 mr/hr one hour and fifteen minutes after shot time, and Reed, which is approximately 48 miles from the test site, received a maximum intensity of 1200 mr/hr. It was estimated that a 10-week integrated dose at Lincoln Mine was approximately 1.75 r. However, the 24-hour average air concentration of radioactivity at Lincoln Mine was only 0.06 $\mu c/m^3$, and it was estimated that the mean particle size was greater than 50 μ. This indicated that the air concentration at Lincoln Mine was less than the tolerance (internal dose) set up by the JANGLE Feasibility Committee by a factor of 1000 or greater. Post-shot analysis indicated that this high rate of fall-out at Lincoln and Reed Mines was due to the very strong winds aloft, which averaged over 75 mph. It is estimated that those particles which would normally have fallen within a radius of 10 to 25 miles from zero point actually fell at 40 to 75 miles because of these high winds. The relatively high dose received by Lincoln Mine personnel caused considerable concern to the Test Director's Organization and to the Advisory Panel. The question was raised as to how many times Lincoln Mine could receive this amount of fall-out without exceeding the radiation tolerances set by the AEC. It was agreed that Lincoln Mine could be "hit" only once more with the same intensity within a 10-week period. At this time, Off-Site Operations noticed some relationship between the particle size distribution and intensity of fall-out, and from this relationship and estimates of previous tower shots, it was thought that Lincoln Mine would not receive more than .5 r integrated dose from a nominal bomb on a 300-foot tower. The lifetime integrated dose for this shot at Ely, Nevada, approximately 200 miles north of ground zero, was approximately .5 r. (No significant fall-out occurred in populated areas around the site in shots subsequent to Shot 5 other than at Groom Mine). Because of the high amount of radioactive fall-out at Lincoln Mine after Shot 5, and since the communications relay aircraft was unable to contact vehicles in that vicinity, two fixed radio stations were established, one at Groom Mine and one at Lincoln Mine, for the purpose of effecting evacuation of Groom Mine in the event of excessive fall-out or of advising the Groom and Lincoln Mine personnel to remain indoors if the fall-out was slightly greater than that expected. As it turned out, there was no necessity for the evacuation of Groom or

Lincoln Mine. At the end of the operations no populated area around NPG received a lifetime dose greater than 3 r. In other words, Groom and Lincoln Mines were "hit" just once during the entire TUMBLER-SNAPPER series. It seemed that much more consternation resulted from the passage of the atomic cloud over Salt Lake City, Utah, where the peak fall-out did not exceed 10 mr/hr, with negligible integrated dose, than from the dosage received at Groom and Lincoln Mines. All locations which received significant fall-out were continually monitored on E+1 through E+10 Days, and numerous water samples were taken in the fall-out area and analyzed, with no appreciable concentration of radioactivity being found. The information collected by the Off-Site Operations Department is shown in Tables E.1 through E.5 and Figures E.1 through E.6.

E.2 MATERIEL AND LOGISTICS

At the beginning of the test series it was believed that a telephone in the On-Site Briefing Room would be more of a hindrance than a help, and therefore a telephone was not requested. However, since experience indicated the desirability of a field-type telephone between the On-Site Briefing Room and the On-Site Operations Office, the telephone was procured through the AEC and installed just prior to this shot. Numerous wooden stakes placed in the target area to designate distances from ground zero were destroyed by heat and blast and had to be replaced. It was originally requested that these signs be made of steel, but the wooden stakes were accepted as an expedient.

In order to estimate supplies, equipment and modifications of existing facilities, etc., that would be needed for the next operation, questionnaires were sent out to the various sections of Rad-Safe. Suggested modifications were discussed with the various section heads and those modifications desired were sent to the J-6 Division of AEC for approval and action. Supply lists were filed to be studied and used as a basis of requisitioning supplies for the next operation.

For Shot 5, 1174 sets of protective clothing and all the instruments available (90 MX-5's and 163 TLB's) were issued.

E.3 ON-SITE OPERATIONS

In contrast to the air shots of this series, Shot 5 resulted in a large area of residual ground contamination of relatively high intensities. Since this was the first tower shot detonated in NPG, a constant check and analysis was made of all intensity readings to establish the rate of decay (see Chapter 6, par. 6.2.6). Only a few isolated readings greater than 10 r/hr were reported by the survey teams since it was imperative for this and future shots to keep the accumulated individual doses of all Rad-Safe monitors as low as possible consistent with obtaining necessary information. A diagram of the area north of the CP indicating all areas greater than 10 mr/hr was made daily and submitted

to the J-3 Section for distribution to all interested parties. Due to the large area of contamination and the nature of terrain, it was not possible for the initial post-shot survey teams to complete the closure of the isointensity lines. Efforts to close the isointensity lines met with better success on E+1 and E+2 Days, as is indicated on the Isointensity Plots (Figs. E.9 through E.9.4). It was noted that the stakes within approximately 1200 to 1500 feet of ground zero were destroyed or blown down, so that they did not provide adequate reference points. It was therefore decided that on subsequent shots these innermost stakes would not be set out prior to detonation. It was necessary to set up Rad-Safe control along segments of the main roads contaminated by this shot for persons passing through these areas in going to "clean" working areas.

The Test Director's Operational Order #1-52, Annex E scheduled 17 programs and 44 projects for participation in technical test activities. Due to the high levels of contamination, technical recovery parties were delayed several hours or rescheduled for entry on subsequent days. After Shot 5 the problem of induced radiation in recovery test equipment and materiel was even more critical than after the fourth shot. It therefore became necessary to add a complete night crew to the Vehicle Decontamination Station to handle the increased work load. Accumulated doses for individuals working in contaminated areas after Shot 5 showed a sharp rise over those resulting from the previous shots. This is illustrated graphically in Figure E.10. Although only a few of the Rad-Safe personnel had accumulated doses in the neighborhood of 3 r, after Shot 5 many of them were sufficiently high to preclude their use as field monitors on later shots. The wisdom of rotating personnel between departments and within the On-Site Operations Department, which had been done periodically as a matter of well-rounded training, was now realized, since it became a matter of necessity to utilize persons with low accumulated doses to accomplish the on-site monitoring requirements without over-exposures.

The data obtained by this department are shown in Table E.6 and Figures E.7 through E.10. Due to the irregular nature of all the tower shots, no Plot of Intensity vs. Distance is included.

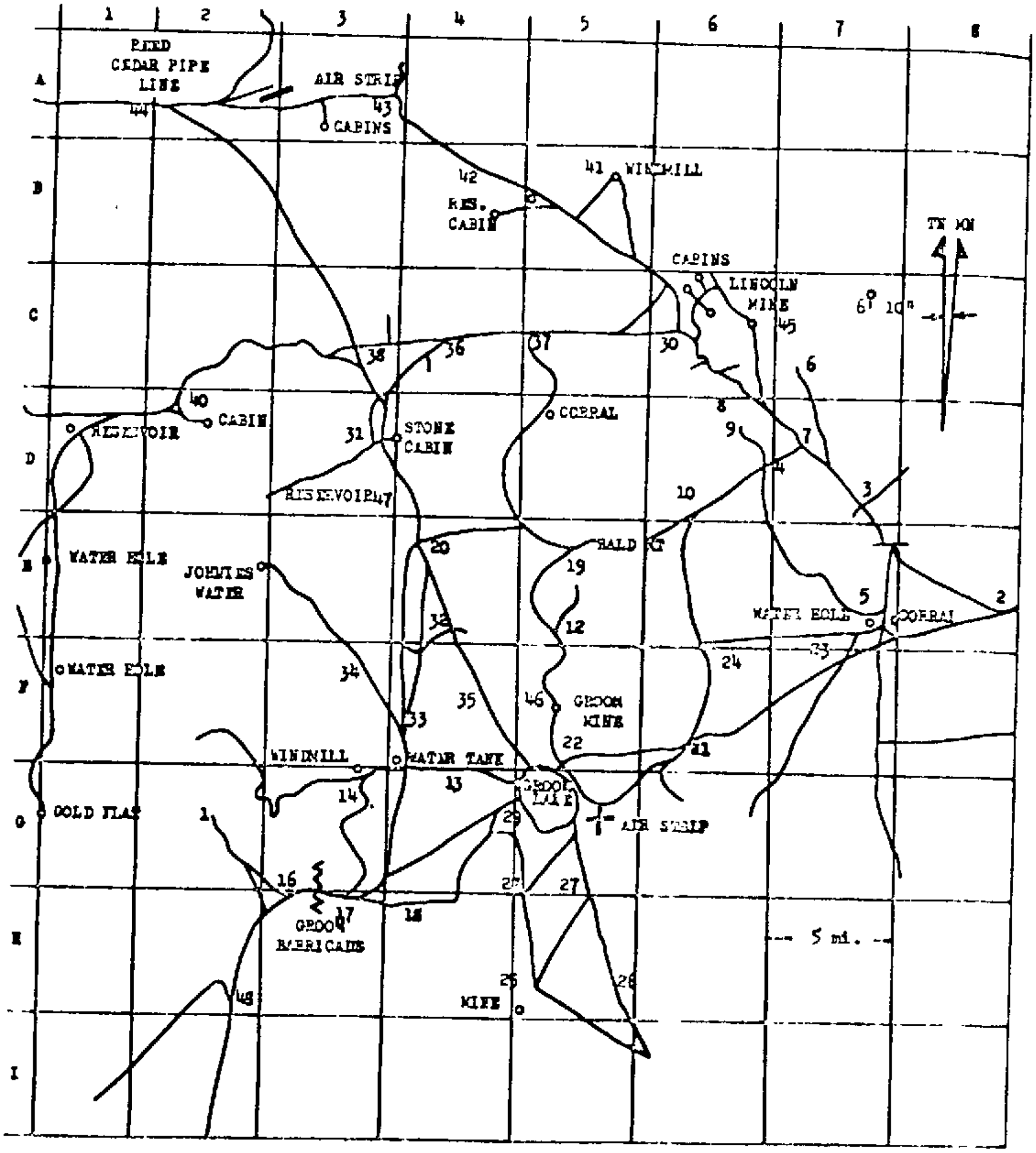


Fig. E.1 Detail Map Groom Mine Area, Rad-Safe Off-Site Map #101 (to be used with Tables E.1, F.1, G.1, and H.1)

TABLE E.1

Ground Mobile Monitors' Report - Shot 5 - 7 May 1952 (See Fig. E.1)
(Normal background: .02 - .04 mr/hr).

TIME (PST)	READING Mr/Hr	GRID LOCATION (Ref.Fig. E.1)	LOCATION IN DETAIL	REMARKS
(7 May 1952)				
0400	.02	E5 S3	Alamo, Nevada	
0405	.02	E2 S2	Groom Mine	
0410	.01	E3 S3	Station 7	
0415	.01	E2 S2	Groom Mine	
0430	.02	E4 S3	JCt. US 93 Nev 38	
0435	.05	E2 S2	Groom Mine	
0435	.01-.04	E3 S3	Station 7	
0445	.01-.05	E3 S3	Station 7	
0445	.01	E4 S3	2 mi. S of Crystal Spgs on US 93	
0445	.02	E2 S2	Groom Mine	
0455	.03-.06	E2 S3	Station 8	
0500	.02	E5 S2	Alamo	
0500	.04	E2 S2	Groom Mine	
0500	15	E2 S3	2 mi. N of Sta. 8	
0505	18	E3 S3	3 mi. N of Sta. 8	
0510	.02	E2 S2	Groom Mine	
0510	32	E3 S2	6 mi. N of Sta. 8	
0515	20	E2 S3	Sta. 30	
0515	.03	E2 S2	Groom Mine	
0515	.02	E5 S2	Alamo	
0515	80	E2 S3	Station 30	
0520	300	E2 S4	Halfway between Sta. 30 & 41	
0523	200	E2 S3	Sta. 30	
0530	1000	E3 S3	Sta. 8	
0530	.02	E2 S2	Groom Mine	
0530	.02	E5 S1	17 Mi. S of Alamo on US 93	
0530	.01	F3 S5	Pioche	
0535	600	E2 S3	Halfway between Sta. 7 & 8	
0540	40	E2 S3	Sta. 7	
0540	.01	F3 R0	2 mi. N of Pioche on US 93	
0545	.02	E2 S2	Groom Mine	
0545	.02	E5 S1	25 mi. S of Alamo on US 93	
0550	.02	E2 S2	Groom Mine	
0550	.02	F2 R0	13 mi. N of Pioche on US 93	
0550	40	E2 S3	Sta. 7	
0555	300	E2 S2	Sta. 8	
0600	.02	E5 S1	16 mi. S of Alamo on US 93	
0600	.02	F2 R1	21 mi. N of Pioche on US 93	
0600	.015	E2 S2	Groom Mine	
0600	260	E2 S3	Sta. 30	
0604	.15	F2 R1	23 Mi. N of Pioche on US 93	

TABLE E.1 (Cont'd.)

[illegible]	READING Mr/Hr	GRID LOCATION (Ref. Fig. E.1)	LOCATION IN DETAIL	REMARKS
[illegible].5	200	E2 S5	Sta. 41	
[illegible]10	.5	F2 R1	25 Mi. N of Pioche on US 93	
[illegible]10	.02	E2 S2	Groom Mine	
[illegible]10	260	E2 S3	Sta. 30	
[illegible]12	2	F2 R1	26 mi. N of Pioche on US 93	
[illegible]13	4	F2 R1	27 mi. N of Pioche on US 93	
[illegible]14	9	F2 R2	28 mi. N of Pioche on US 93	
[illegible]15	10	F2 R2	29 mi. N of Pioche on US 93	
[illegible]15	.02	E5 S2	8 mi. S of Alamo on US 93	
[illegible]18	6	F2 R2	31 mi. N of Pioche on US 93	
[illegible]	20	F2 R2	33 mi. N of Pioche on US 93	
[illegible]	.02	E2 S2	Groom Mine	
[illegible]	300	E2 S3	Sta. 8	
[illegible]21	100	F2 R2	34 mi. N of Pioche on US 93	
[illegible]24	50	F2 R2	37 mi. N of Pioche on US 93	
[illegible]25	170	F2 R3	39 mi. N of Pioche on US 93	
[illegible]	85	F2 R3	40 mi. N of Pioche on US 93	
[illegible]	.02	E5 S2	Alamo, Nev.	
[illegible]	[illegible]30	F2 R3	39 mi. N of Pioche on US 93	
[illegible]3	90	F2 R3	37 mi. N of Pioche on US 93	
[illegible]	70	F2 R2	35 mi. N of Pioche on US 93	
[illegible]43	60	F2 R2	33 mi. N of Pioche on US 93	
[illegible]45	20	E2	Sta. 7	
[illegible]3	32	F2 R2	30 mi. N of Pioche on US 93	
[illegible]	.03	E2 S2	Groom Mine	
[illegible]51	29	F2 R2	28 mi. N of Pioche on US 93	
[illegible]55	24	F2 R1	25 mi. N of Pioche on US 93	
[illegible]	22	F2 R1	21 mi. N of Pioche on US 93	
[illegible]	22	F2 R1	21 mi. N of Pioche on US 93	
[illegible]	80	E2 S3	Sta. 8	
[illegible]	.02	E4 S3	Jct. US 93 Nev 38	
[illegible]5	.02	E2 S2	Groom Mine	
[illegible]5	210	E2 S3	Sta. 30	
[illegible]5	21	F2 R1	17 mi. N of Pioche on US 93	
[illegible]10	18	F2 R1	12 mi. N of Pioche on US 93	
[illegible]5	16	F2 R0	9 mi. N of Pioche on US 93	
[illegible]	15	F3 R0	7 mi. N of Pioche on US 93	
[illegible]	120	E2 S5	Sta. 41	
[illegible]	13	F3 R0	5 mi. N of Pioche on US 93	
[illegible]727	11	F3 R0	4 mi. N of Pioche on US 93	
[illegible]	11	F3 F5	1 mi. N of Pioche on US 93	
[illegible]	.02	E4 S3	Jct. US 93 Nev 38	
[illegible]	11	F3 S5	Pioche, Nev.	
[illegible]35	100	E2 S3	Sta. 30	

TABLE E.1 (Cont'd.)

TIME (PST)	READING Mr/Hr	GRID LOCATION (Ref. Fig. E.1)	LOCATION IN DETAIL	REMARKS
0735	.03	E2 S2	Groom Lake	
0736	10	F3 S5	Pioche	
0740	.04	E2 S2	1.2 mi. N of Groom Lake	
0741	10	F3 S5	Pioche	
0743	.3-.5	E2 S2	2 mi. N of Groom Lake	
0745	4	E1 S2	Sta. 35	
0745	9	E1 S2	.4 mi. N of Sta. 35	
0745	40	E2 S3	Sta. 7	
0745	72	E1 S2	1 mi. N of Sta. 35	
0747	9	F3 S5	Pioche	
0750	80	E2 S3	Sta. 8	
0750	9	F3 S5	Pioche	
0755	138	E1 S2	1.5 mi. N of Sta. 35	
0800	.01	E4 S3	Crystal Springs	
0800	8	F3 S5	Pioche	
0800	20	E3 S3	Sta. 7	
0810	7.5	F3 S5	Pioche	
0810	70	E3 S2	Sta. 8	
0820	100	E2 S3	Sta. 30	
0830	6	F3 S5	Pioche	
0830	.02	E5 S2	Alamo	
0830	80	E2 S5	Sta. 41	
0835	5	F3 S5	Pioche	
0835	31.5	E0 S3	Sta. 31	
0840	4.5	F3 S5	Pioche	
0845	4	F3 S5	4 mi. N of Pioche on US 93	
0850	.02	E5 S1	15 mi. S of Alamo on US 93	
0855	4	F2 R0	12 mi. S of Alamo on US 93	
0905	4	F2 R1	22 mi. S of Alamo on US 93	
0915	4	F2 R2	32 mi. S of Alamo on US 93	
0920	18	F2 R2	36 mi. S of Alamo on US 93	
0922	48	F2 R2	39 mi. S of Alamo on US 93	
0925	26	F2 R3	41 mi. S of Alamo on US 93	
0927	46	F2 R3	44 mi. S of Alamo on US 93	
0930	.02	E5 S1	5 mi. S of Alamo on US 93	
0930	28	F2 R3	46 mi. N of Pioche on US 93	
0935	24	F2 R3	52 mi. N of Pioche on US 93	
0940	22	F2 R4	56 mi. N of Pioche on US 93	
0945	20	F2 R4	61 mi. N of Pioche on US 93	
0950	15	F2 R5	64 mi. N of Pioche on US 93	
0955	14	F2 R5	71 mi. N of Pioche on US 90	
1000	10	F2 Q6	77 mi. N of Pioche on US 90	
1000	2.5	E1 S2	7 mi. N of "Y" on way N to Groom	
1004	9	E1 S2	9 mi. N of "Y" on way N to Groom	

TABLE E.1 (Cont'd.)

TIME (PST)	READING Mr/Hr	GRID LOCATION (Ref.Fig. E.1)	LOCATION IN DETAIL	REMARKS
[illegible]	72	E2 S4	Lincoln Mine	
[illegible]	3.	E0 S2	Groom Road Barricade	
[illegible]	11	F2 Q0	83 mi. N of Pioche on US 93	
1015	12	F2 Q2	87 mi. N of Pioche on US 93	
1017	.05	E0 S2	5 mi. N of Groom Road Barricade	
1020	12	F2 Q0	91 Mi. N of Pioche on US 93	
1025	13	F1 Q1	95 mi. N of Pioche on US 93	
1030	13	F1 Q1	100 mi. N of Pioche on US 93	
[illegible]	.02	E2 S2	Groom Lake	
1035	.3	D5 S4	Reed (Sta. 44)	
1040	.02	E2 S2	Sta. 21	
1045	10	F0 Q1	Ely, Nev.	
1115	.5	E0 S4	Sta. 42	
1120	10	F0 Q1	Ely, Nev.	
[illegible]	3 - 6	E9 S5	Road N to Sta. 41	
1126	10	E2 S5	S. of Sta. 41	
[illegible]	10	E3 S3	Sta. 7	
1130	5	F0 Q1	9 mi. W of Ely on US 6	
1132	16	E3 S3	4 mi. N of Sta. 7	
1135	30	E3 S3	6 mi. N of Sta. 7	
1135	52	E3 S4	42 mi. W of Sta. 30	
[illegible]	40	E2 S3	8 mi. N of Sta. 7	
1140	34.4	E2 S3	Sta. 30	
1140	5	E5 Q0	18 mi. W of Ely on US 6	
1142	60	E2 S3	9 mi. N of Sta. 7	
1144	40	E1 S3	9½ mi. N of Sta. 7	
1145	30	E2 S3	1 mi. from Lincoln Mine	
1148	30	E1 S5	10½ mi. N of Sta. 7	
1150	30	E2 S5	Sta. 41	
[illegible]	4.6	E5 Q0	24 mi. W of Ely on US 6	
[illegible]	4.8	E5 Q0	31 mi. W of Ely. on US 6	
[illegible]	22	E2 S4	3 mi. N of Lincoln Mine	
[illegible]	4.4	E4 R5	40 mi. W of Ely on US 6	
1215	22	E2 S4	Lincoln Mine	
[illegible]	4.2	E4 R5	49 mi. W of Ely on US 6	
1225	4.1	E3 R4	Current (On US 6)	
1230	4	E0 R4	7 mi. E of Current on US 6	
1230	30	E2 S3	Sta. 30	
1230	.3	E0 S4	Sta. 43	
1235	48	E2 S3	1 mi. past Sta. 30	
1238	48	E2 S3	Sta. 8	
1240	.2	D5 S4	Sta. 44	
1240	4.3	E4 R5	15 mi. E of Current on US 6	
1245	20	E2 S4	Lincoln Mine	

TABLE E.1 (Cont'd.)

T[illegible] ([illegible])	READING Mr/Hr	GRID LOCATION (Ref.Fig. E.1)	LOCATION IN DETAIL	REMARKS
1245	18	E3 S3	Sta. 7	
125[illegible]	4.1	E5 Q0	25 mi. E of Currant on US 6	
13[illegible]	10	E3 S2	Sta. 5	
1[illegible]	3.8	E5 Q0	31 mi. E of Curr[illegible]t on US 6	
1[illegible]	4	E5 Q1	44 mi. E of Curr[illegible]t on US 6	
13[illegible]	3	E2 S3	Sta. 8	
132[illegible]	6	F0 Q1	Ely, Nev.	
1330	3	E2 S3	Sta. 8	
13[illegible]	10	E1 S3	Sta. 36	
13[illegible]	50	E1 S3	Sta. 20	
1[illegible]	60	S1 S3	½ mi. S of Sta. 20	
1400	18	E2 S4	Lincoln Mine	
1405	15	E0 S3	Sta. 32	
1415	60	E1 S2	N of Sta. 35	
1420	3	E3 S3	Sta. 7	
1430	5	F0 Q1	Ely, Nev.	
14[illegible]5	.05	E2 S2	Groom Mine	
1445	5	F1 Q0	12 mi. S of Ely on US 93	
1500	3	E3 S3	Sta. 7	
15[illegible]	4.2	F2 Q0	21 mi. S of Ely on US 93	
1515	6	F2 Q2	38 mi. S of Ely on US 93	
1530	6	F2 R3	54 mi. S of Ely on US 93	
1530	13	E2 S4	4 mi. N of Lincoln Mine	
1545	6	F2 R3	67 mi. S of Ely on US 93	
1545	14	E2 S4	Lincoln Mine	
1600	3.4	F2 R2	83 mi. S of Ely on US 93	
16[illegible]0	13	E2 S4	Lincoln Mine	
1615	3.4	F2 R1	98 mi. S of Ely on US 93	
1615	13	E2 S4	Lincoln Mine	
1620	3.4	F3 S5	Pioche, Nev.	
1630	12	E2 S4	Lincoln Mine	
1[illegible]5	12	E2 S4	Lincoln Mine	
17[illegible]	12	E2 S4	Lincoln Mine	
1730	10	E2 S4	Lincoln Mine	
1745	9	E2 S4	Lincoln Mine	
1[illegible]00	8	E2 S4	Lincoln Mine	
1[illegible]15	7	E2 S4	Lincoln Mine	
1[illegible]15	.02	E3 S2	Rd. from Crystal Spgs. to Groom Mine	
1[illegible]	6	E3 S2	Rd. from Crystal Spgs. to Groom Mine	
1[illegible]5	5	E2 S4	Lincoln Mine	
19[illegible]0	4.5	E2 S4	Lincoln Mine	
1930	5	E2 S4	Lincoln Mine	
2000	4.5	E2 S4	Lincoln Mine	
2015	4	E2 S4	Lincoln Mine	

TABLE E.1 (Cont'd.)

TIME (PST)	READING Mr/Hr	GRID LOCATION (See Fig. E.1)	LOCATION IN DETAIL	REMARKS
2045	3	E2 S4	Lincoln Mine	
2100	2	E2 S4	Lincoln Mine	
0400	.02		Air Sampling & Fall-Out Sta., Lincoln Mine	
0500	5		" " " " " " "	
0507	80		" " " " " " "	
0510	300		" " " " " " "	
0511	400		" " " " " " "	
0515	600		" " " " " " "	
0530	800		" " " " " " "	
0540	400		" " " " " " "	
0545	310		" " " " " " "	
0550	270		" " " " " " "	
0600	220		" " " " " " "	
0615	180		" " " " " " "	
0630	160		" " " " " " "	
0645	150		" " " " " " "	
0700	110		" " " " " " "	
0715	100		" " " " " " "	
0730	90		" " " " " " "	
0745	80		" " " " " " "	
0800	80		" " " " " " "	
0815	70		" " " " " " "	
0830	60		" " " " " " "	
0845	60		" " " " " " "	
0900	60		" " " " " " "	
0915	40		" " " " " " "	
0930	40		" " " " " " "	
0945	40		" " " " " " "	
1000	32		" " " " " " "	
1015	32		" " " " " " "	
1030	32		" " " " " " "	
1045	30		" " " " " " "	
1100	28		" " " " " " "	
1115	28		" " " " " " "	
1130	26		" " " " " " "	
1145	25		" " " " " " "	
1200	24		" " " " " " "	
1215	22		" " " " " " "	
1230	22		" " " " " " "	
1245	22		" " " " " " "	
1300	20		" " " " " " "	
1315	20		" " " " " " "	
1330	19		" " " " " " "	
1345	18		" " " " " " "	

TABLE E.1 (Cont'd.)

TIME (PST)	READING Mr/Hr	GRID LOCATION (Ref.Fig. E.1	LOCATION IN DETAIL REMARKS
1400	18		Air Sampling & Fall-Out Sta., Lincoln Mine
1415	16		" " " " " " "
1430	16		" " " " " " "
1445	15		" " " " " " "
1500	15		" " " " " " "
1515	14		" " " " " " "
1530	14		" " " " " " "
1545	14		" " " " " " "
1600	13		" " " " " " "
1615	13		" " " " " " "
1630	12		" " " " " " "
1645	12		" " " " " " "
1700	12		" " " " " " "
1715	10		" " " " " " "
1730	10		" " " " " " "
1745	9		" " " " " " "
1800	8		" " " " " " "
1815	8		" " " " " " "
1830	5		" " " " " " "
1845	4.5		" " " " " " "
(8 May 1952)			
1340	21		Water tank between Sta. 13 & 14
1340	40		Between watertank and Sta. 33
1545	7 - 8		Lincoln Mine
(9 May 1952)			
1209	14		Watertank between Sta. 13 & 14
1214	19		Sta. 33
(10 May 1952)			
-	5.3		Sta. 14
-	3.5		Sta. 37
-	.65		Sta. 41
-	.22		Sta. 31
(16 May 1952)			
0830	.02-.05		East of Groom Lake, to the Corral
0850	.03-.05		North from Corral to Sta. 7
0910	.5- 1.0		North from Sta. 7 to Sta. 8
0925	.4-.8		North from Sta. 8 to Lincoln Mine
1005	.2-.4		West from Sta. 30 to 31
1015	.1-.3		South from Sta. 31 to 32
1035	2.0-4.0		8 to 9 mi. N of Groom Lake
1045	.2-.8		7 to 8 mi. N of Groom Lake
1100	.01-.05		4 mi. N of Groom Lake to Groom Mine
1108	.2		2 mi. N of Sta. 17
1115	.3-.4		2.6 mi. N of Sta. 17

TABLE E.1 (Cont'd.)

TIME (PST)	READING Mr/Hr	GRID LOCATION (Ref.Fig. E.1)	LOCATION IN DETAIL	REMARKS
1122	1.4		3.9 mi. N of Sta. 17	
1131	4		1 mi. W of Sta. 14	
1141	6		2.5 mi. SW of Sta. 14	
1210	9-10		3.3 mi. SW of Sta. 14	
1249	2		Watertank W of Sta. 13	
1307	.01-.06		4.2 mi. W of Groom Lake to the Lake	
(17 May 1952)				
-	.03		Groom Road Barricade	
-	1.4		Watertank W of Sta. 13	
-	4		5.8 mi. N of Sta. 17	
-	4.5		6.1 mi. N of Sta. 17	
-	4		6.5 mi. N of Sta. 17	
-	3.5		7.1 mi. N of Sta. 17	
-	.6		Sta. 32	
-	.02		North edge of Groom Lake	
(19 May 1952)				
0855	1.3		Sta. 13	
0900	3		Sta. 33	
0916	.5		Sta. 32	
0931	.04		Sta. 31	

TABLE E.2

Aerial Terrain Survey Report (Badger I & II, Woodchuck I & II) - Shot 5 - 7 May 1952 (See Fig. A.2). (Background of .02 Recorded Readings have been Compensated.) (Code: Badger - C-47 aircraft. Woodchuck - L-20).

Report Number	Grid Position (Ref. Fig. A.2)	Time of Report (PST)	Absolute Altitude (ft)	B-21 Meter Reading (Millivolts B.G./B.G.Cont.)	Rate Meter Reading (Counts/Min)	Geiger - Mueller Reading (Mr/Hr)
(7 May 1952)						
BADGER I						
1	1B20	0735	800	70/70,000	85,000	5
2	1C0	0741	500	70/12,000	8,000	4.2
3	1C1	0746	500	70/800	10,000	.3
4	1C2	0749	1500	70/120	10,000	.01
5	1C3	0752	1500	110/110	900	0
6	1C4	0756	800	110/110	850	0
7	1C5	0800	500	70/70	3,800	.01
8	1D5	0803	500	70/70	700	0
9	1D4	0807	500	70/70	700	.02
10	1D3	0810	1000	70/100	2,500	.45
11	1D2	0815	1000	70/2300	6,200	1.20
12	1D1	0818	1500	70/1000	2,400	.45
13	1D0	0823	500	70/500	3,800	.01
14	1E0	0829	1500	90/90	3,800	0
15	1E1	0833	1000	90/270	4,200	.02
16	1E2	0836	1500	90/400	5,000	.13
17	1E3	0840	700	90/2800	12,600	2.6
18	1E4	0846	1500	90/500	7,600	.08
19	1E5	0849	1500	80/80	7,000	0
20	1E6	0853	1000	80/80	7,000	0
21	1E7	0856	700	80/80	7,000	0
22	1E8	0900	1000	80/80	7,000	0
23	1(E.5)9.2	0906	800	80/80	7,000	0

TABLE E.2 (Cont'd.)

Report Number	Grid Position (Ref. Fig. A.2)	Time of Report (PST)	Absolute Altitude (Ft)	B-21 Meter Reading (Millivolts B.G./B.G.Cont.)	Rate Meter Reading (Counts/Min)	Geiger-Mueller Reading (Mr/Hr)
24	1F10	0910	800	80/80	6,000	0
25	1F9	0915	1000	80/80	7,000	0
26	1F8	0919	1000	90/90	6,800	0
27	1F7	0923	800	80/80	6,800	0
28	1F6	0926	1500	80/80	7,000	0
29	1F5	0930	1000	80/500	7,000	.10
30	1F4	0934	1500	80/800	8,000	.55
31	1F3	0938	1500	80/600	7,600	.28
32	1F2	0943	1000	80/400	11,000	.08
33	1F1	0946	500	80/250	12,500	.01
34	1F0	0949	1500	80/130	13,000	0
35	1G0	0954	1000	100/100	13,000	0
36	1G2	1001	500	90/150	14,000	.02
37	1G3	1006	1000	90/250	2,000	.02
38	1G5	1014	1500	90/380	3,400	.04
39	1G6	1018	1000	90/400	3,500	.03
40	1G7	1022	1000	90/90	3,500	0
41	1G8	1025	500	90/90	3,500	0
42	1G9	1029	1500	90/100	3,500	0
43	1G10	1032	1000	90/90	3,500	0
44	1G11	1034	1500	90/90	3,500	0
45	1G12	1037	1000	100/100	3,500	0
46	1(G.5)13	1040	800	90/300	3,400	0
47	1H13	1044	2000	100/100	3,400	0
48	1H12	1048	1500	100/100	3,400	0
49	1G11	1052	1000	90/200	4,000	.3
50	1H10	1056	500	100/950	4,100	.3
51	1H9	1100	1500	100/260	3,400	0
52	1H8	1104	500	100/970	4,400	.3

TABLE E.2 (Cont'd.)

Report Number	Grid Position (Ref. Fig. A.2)	Time of Report (PST)	Absolute Altitude (Ft)	B-21 Meter Reading (Millivolts B.G./B.G.Cont)	Rate Meter Reading (Counts/Min)	Geiger-Mueller Reading (Mr/Hr)
53	1H7	1107	1500	100/730	3,800	.06
54	1G6	1111	1000	100/400	3,400	.02
55	1(H.5)5	1114	2000	100/200	3,600	.01
BADGER II			(m.s.l.)			
1	1C2	0600	10,000	140/670	40	0
2	1B2	0608	10,000	140/840	40	.05
3	4E1	0620	10,000	150/150	40	.05
4	1D2	0647	10,000	210/425	60	.05
5	1D4	0704	10,000	160/555	160	.1
6	1F9	0719	10,000	150/160	20	.05
7	1B2	0804	10,000	150/350	40	.1
8	1F2	0840	10,000	150/250	100	.05
9	1D½2	0928	10,000	150/360	200	.05
10	1D2	1042	10,000	140/320	Neg.	.05
WOODCHUCK I			(absolute)			
1	1B4	0756	200			.001
2	1C3	0805	150			20
3	1D2	0817	500			.005
4	1E1	0824	25			.005
5	1D2	0955	15			5
WOODCHUCK II						
1	4C1	0704	20			.02
2	1C3	0721	25			.03
3	1½A3	0723	20			.02
4	4½A1	0740	25			.03
5	4A1	0743	25			.03
6	1A3	0759	20			.02
7	1A½3	0801	20			.04
8	4A½3	0822	500			.02

TABLE E.2 (Cont'd.)

Report Number	Grid Position (Ref. Fig. A.2)	Time of Report (PST)	Absolute Altitude (Ft)	B-21 Meter Reading (Millivolts B.G./B.G.Cont.)	Rate Meter Reading (Counts/Min)	Geiger-Mueller Reading (Mr/Hr)
9	4B1	0830	100			.03
10	1B5	0846	300			.02
(8 May 1952)						
BADGER I						
1	2C2	0745	700	70/70	400	0
2	2C0	0753	500	75/75	450	0
3	2E0	0805	500	80/80	500	0
4	3E2	0814	500	75/75	500	0
5	3D2	0820	500	75/75	500	0
6	3D3	0825	500	75/75	500	0
7	3C3	0833	1000	75/75	500	0
8	3C5	0835	1000		500	0
9	3A5	0848	1000		500	0
10	3A6	0852	500	75/78	600	0
11	4A6	0900	1000	85/85	600	0
12	4C4	0912	500	85/120	600	0
13	1D1	0930	1000	109/250	800	0
14	1C3	0938	1000	95/95	850	0
15	1C5	0945	1000	90/90	800	0
16	2A5	0952	1000	85/85	800	0
17	2B4	1013	500	80/80	800	0
18	2C4	1015	1000	70/90	800	0
19	2C3	1019	500	70/70	800	0
BADGER II						
1	2F5	0803	4000	130/130	40	0
2	2G3	0810	6000	130/130	60	0
3	3G4	0834	4000	120/120	80	0
4	3F5	0839	2000	120/120	80	0
5	3C5	0851	2000	110/110	80	0

TABLE E.2 (Cont'd.)

Report Number	Grid Position (Ref. Fig. A.2)	Time of Report (PST)	Absolute Altitude (Ft.)	B-21 Meter Reading (Millivolts B.G./B.G.Cont.)	Rate Meter Reading (Counts/Min)	Geiger-Mueller Reading (Mr/Hr)
6	3B7	0858	2000	110/110	80	0
7	2B8	0900	2000	110/110	80	0
8	308	0912	5000	120/120	80	0
9	4B6	0920	6000	120/120	80	0
10	4D8	0934	7000	130/130	80	0
11	4G5	0945	7000	140/140	80	0
12	1G3	1005	9500	160/160	80	0
13	1C7	1032	9500	150/150	80	0
14	1C9	1041	9000	140/140	80	0
15	109	1050	9000	140/140	80	0
16	108	1053	9000	140/140	80	0
17	2B8	1100	7000	130/130	80	0
18	2E5	1115	4500	100/100	80	0

TABLE E.3

Aerial Cloud Trackers' Report - (Hounddog I, II & IV) - Shot 5 - 7 May 1952. (See Fig. A.2). (Background of .04 Recorded Readings Have Been Compensated.) (Code: Hounddog - B-29 aircraft).

Report Number	Grid Position (Ref. Fig. A.2)	Time of Report (PST)	Mean Sea Level Altitude (Ft)	B-21 Meter Reading (Millivolts B.G./B.G.Cont.)	Rate Meter Reading (Counts/Min)	Geiger - Mueller Reading (Mr/Hr)
HOUNDDOG I						
1	1C3	0453	15,000			0
2	3A1	0512				0
3	1G2	0552	15,000			3
4	1H2	0556	15,000			15
5	1H3	0606	14,000			1
HOUNDDOG II						
4	1H2	0556	15,000			15
5	1H3	0606	14,000			1
6	1M17	0727	24,000			.1
7	1N18	0805	20,000			13
8	1O22	0829	17,000			100
9	1P24	0835	17,000			14
10	1O25	0843	17,000			28
11	1N25	0846	16,000			11
12	1N26	0848	15,500			3
13	1S23	0849	15,000			8
14	1S22	0914	15,500			5
15	1U18	0944	15,000			.6
16	1X21	1000	10,000			.8
17	1X22	1022	10,500			1.1
HOUNDDOG IV						
1	4A1	0452	7,000			0
2	4A2	0456	8,000			0
3	4A2	0458	9,000			0
4	4B3	0601	10,000			.2

TABLE [illegible] (Cont'd.)

Report Number	Grid Position (Ref. Fig. A2)	Time of Report (PST)	Mean Sea Level Altitude (Ft)	B-21 Meter Reading (Millivolts D.G./D.G.Cont.)	Rate Meter Reading (Counts/Min)	Geiger-Mueller Reading (Mr/Hr)
5	4D2	0503	11,000			20
6	4C1	0506	12,000			0
7	4C2	0509	13,000			0
8	4C2	0512	14,000			1
9	4B1	0515	13,000			0
10	4B0	0519	12,000			0
11	4A1	0523	10,000			1
12	4A1	0526	9,000			0
13	4B1	0530	10,000			.7
14	4C0	0535	12,000			0
15	1E1	0539	13,000			0
16	1H3	0543	14,000			2
17	1I2	0548	13,000			5
18	1G1	0553	12,000			0
19	4F0	0556	10,000			.7
20	1G3	0603	11,000			0
21	1J5	0607	13,000			5
22	1J5	0610	13,000			30
23	1H2	0615	12,000			0
24	1H3	0644	11,000			0
25	1I6	0658	12,000			.3
26	1I8	0814	10,000			.3
27	1D7	0732	8,500			.15
28	1E3	0748	9,000			.4
29	1I1	0800	10,500			Neg.
30	1G1	0815	9,500			Neg.

TABLE E.4

Fixed Air Sampling and Fall-out Tray Report - Shot 5 - 7 May 1952 **

CODE	STATION	AIR CONCENTRATION $\mu c/m^3$ 1 Hr.	AIR CONCENTRATION $\mu c/m^3$ 24 Hrs.	F. O. TIME AFTER H-HOUR	FALL-OUT TRAYS d/m	FALL-OUT TRAYS Part/Tray	FALL-OUT TRAYS μc/Part	PARTICLE SIZE MMD	PARTICLE SIZE % < 5 μ	BACKGROUND RECORDER Arrival Time	BACKGROUND RECORDER High Reading Mr/Hr
CP	CP	-	20.3×10^{-6}	(1)*	1.36×10^{6}	-	-	-	-	-	Bkgd.
M	MERCURY	-	20.3×10^{-6}	(3)	13.4×10^{6}	-	-	-	-	-	Bkgd.
IS	INDIAN SPGS	-	48.7×10^{-6}	(2)	Lost	-	-	-	-	-	Bkgd.
CU	CURRANT	-	19.8×10^{-6}	(3)	Lost	-	-	-	-	4	4
LM	LINCOLN MINE	1.176	57.3×10^{-3}	1	2.42×10^{9}	-	-	-	-	-	-
GM	GROOM MINE	464×10^{-6}	64.3×10^{-6}	1	1.82×10^{6}	-	-	-	-	-	0.5
LV	LAS VEGAS	-	38.3×10^{-6}	(2)	1.91×10^{6}	-	-	-	-	-	Bkgd.
PI	PIOCHE	238×10^{-6}	33.5×10^{-6}	6	7.95×10^{6}	-	-	-	-	3.5	0.4
CS	CRYSTAL SPR	3.01×10^{-3}	195×10^{-6}	$\frac{1}{2}$	$.115 \times 10^{6}$	-	-	-	-	-	Bkgd.
NE	NELLIS AFB	-	44.5×10^{-6}	(2)	67.4×10^{6}	-	-	-	-	-	Bkgd.
WS	WARM SPRINGS	-	4.73×10^{-6}	(3)	Lost	-	-	-	-	-	Bkgd.
TO	TONOPAH	-	18.2×10^{-6}	(3)	Lost	-	-	-	-	-	Bkgd.
BE	BEATTY	-	80.7×10^{-6}	(3)	$.92 \times 10^{6}$	-	-	-	-	-	Bkgd.
CA	CALIENTE	322×10^{-6}	74.5×10^{-6}	5	$.074 \times 10^{6}$	-	-	-	-	-	Bkgd.
GJ	GLENDALE JCT	-	30.4×10^{-6}	(2)	$.075 \times 10^{6}$	-	-	-	-	-	Bkgd.
EL	ELY	1.91	115×10^{-3}	4	73.7×10^{6}	-	-	50	15	4	4.6
AL	ALAMO	227×10^{-6}	55.2×10^{-6}	(2)	2.74×10^{6}	-	-	-	-	-	-

*Times in parenthesis are estimated

**See Explanatory Notes (Page [illegible])

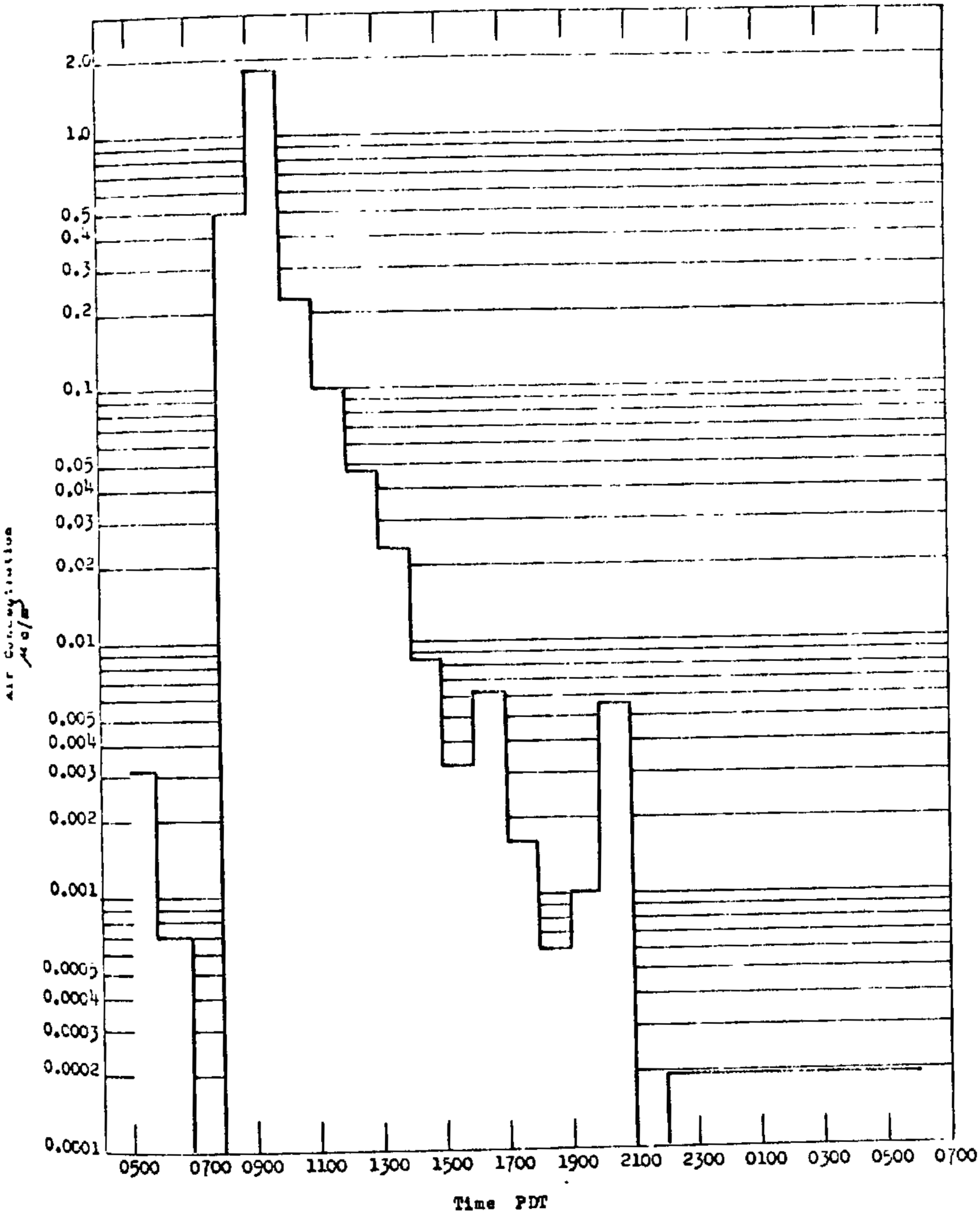


Fig. E.2 Air Concentration at Ely, Shot 5, 7 May 1952 (See Table E.4)
(Note: Time on curve is Pacific Daylight Time)

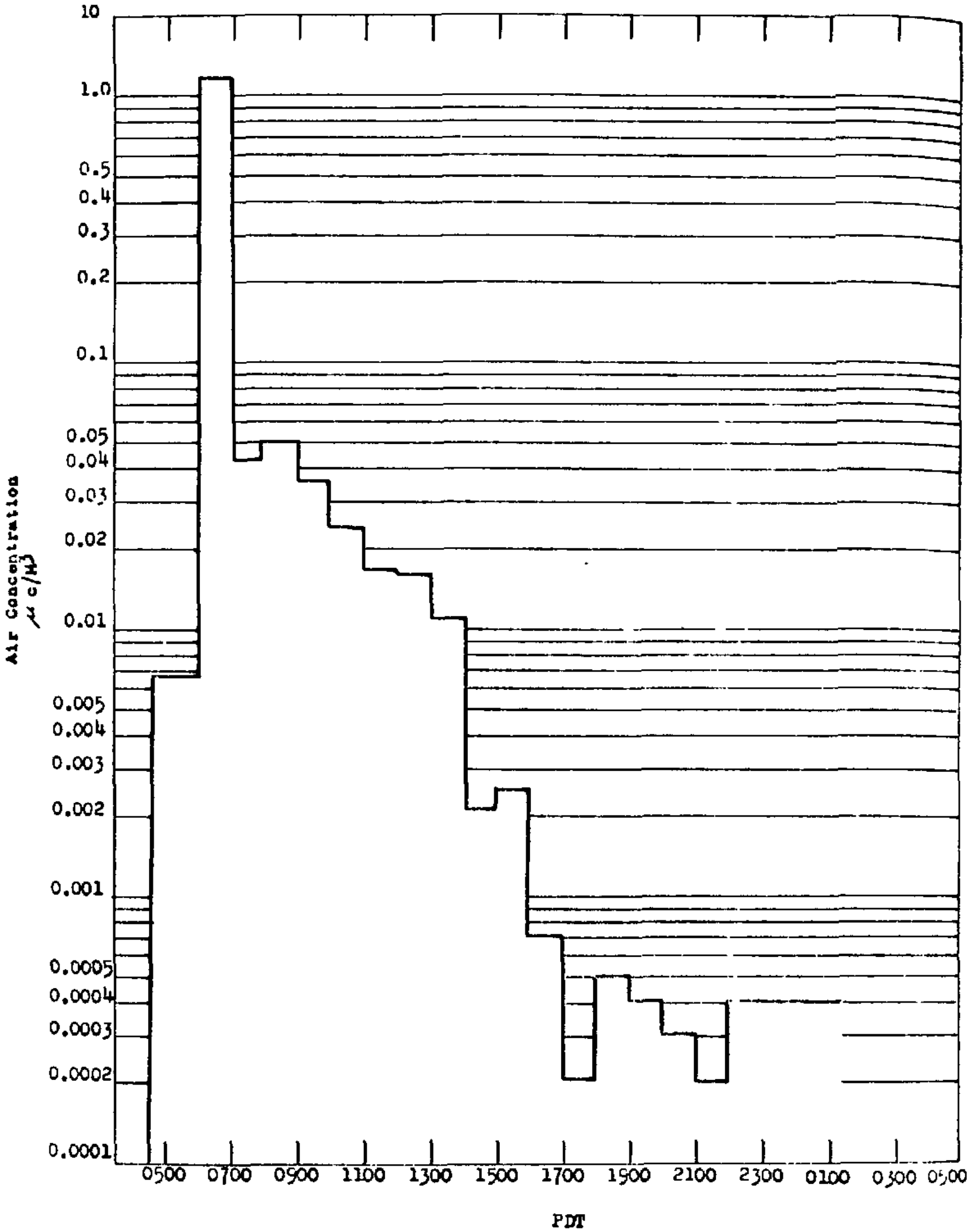


Fig. E.3 Air Concentration at Linclon Mine, Shot 5 (See Table E.4) (Note: Time on curve is Pacific Daylight Time).

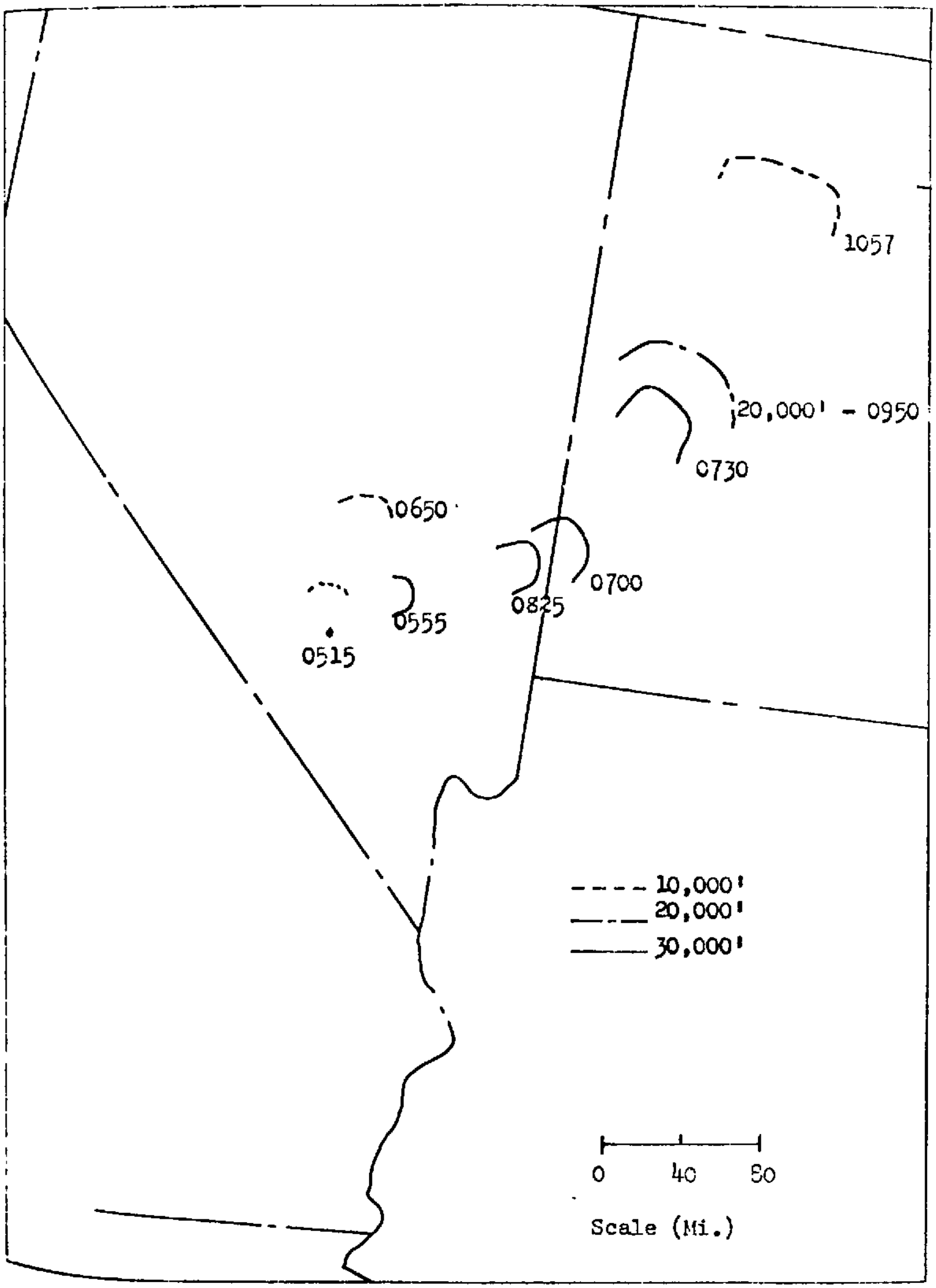


Fig. E.4 Cloud Progression, Shot 5, 0415 (PST)

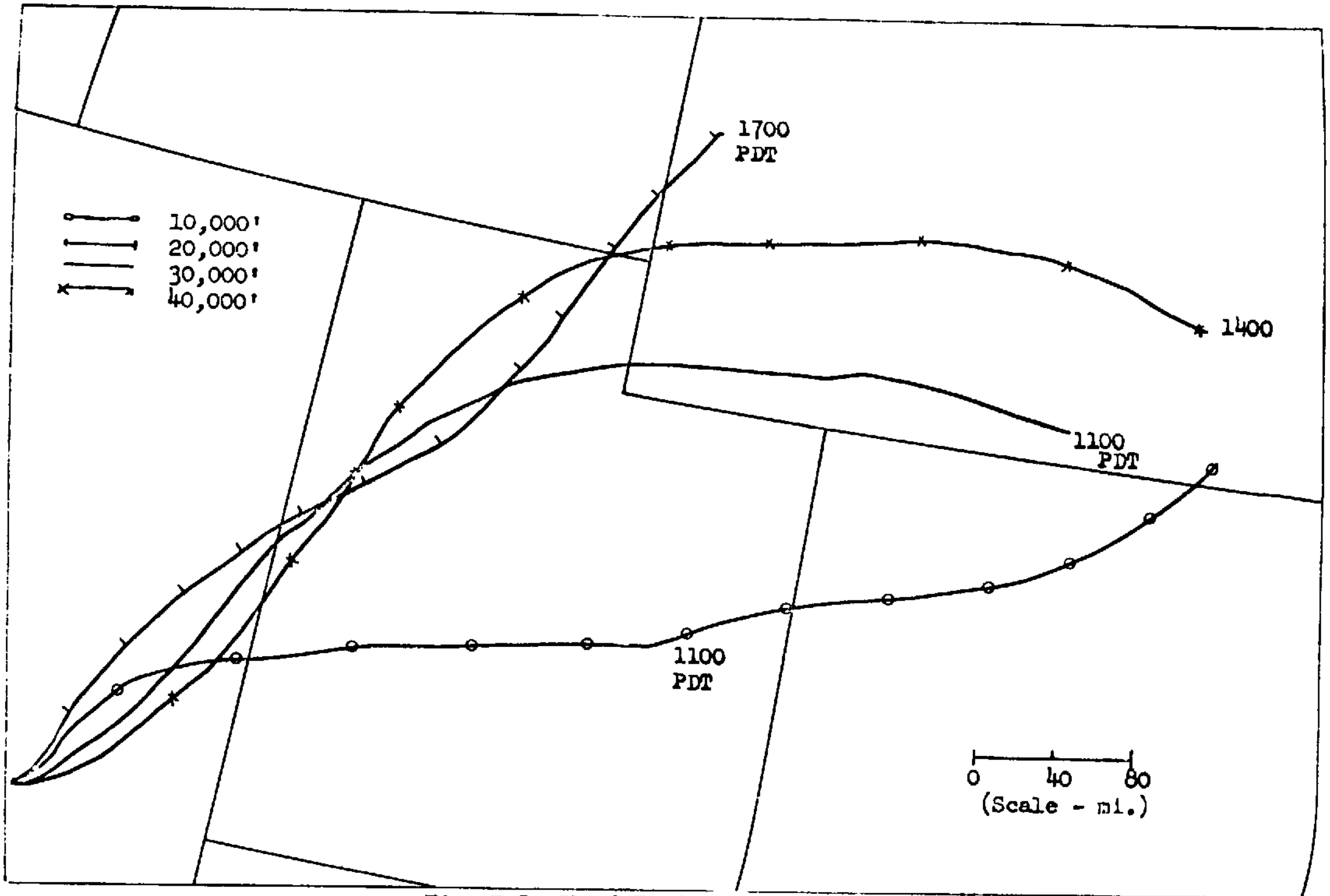


Fig. E.5 Cloud Trajectory, Shot 5

TABLE E.5

[illegible]er Data - (Rawin Taken at CP 6 May 52) - Shot 5 - 7 May 1952

TIME (PST)	Altitude in Feet m.s.l.	Direction in Degrees	Speed in Knots
1400	Surface	000	[illegible]
	4,000	000	[illegible]
	5,000	000	[illegible]
	6,000	180	[illegible]
	7,000	180	[illegible]
	8,000	180	[illegible]
	9,000	190	[illegible]
	10,000	180	[illegible]
	12,000	190	[illegible]
	14,000	190	[illegible]
	15,000	190	[illegible]
	16,000	210	[illegible]
	18,000	210	[illegible]
	20,000	220	[illegible]
	22,000	220	[illegible]
	24,000	220	[illegible]
	25,000	220	[illegible]
	26,000	220	[illegible]
	28,000	220	[illegible]
	30,000	220	[illegible]

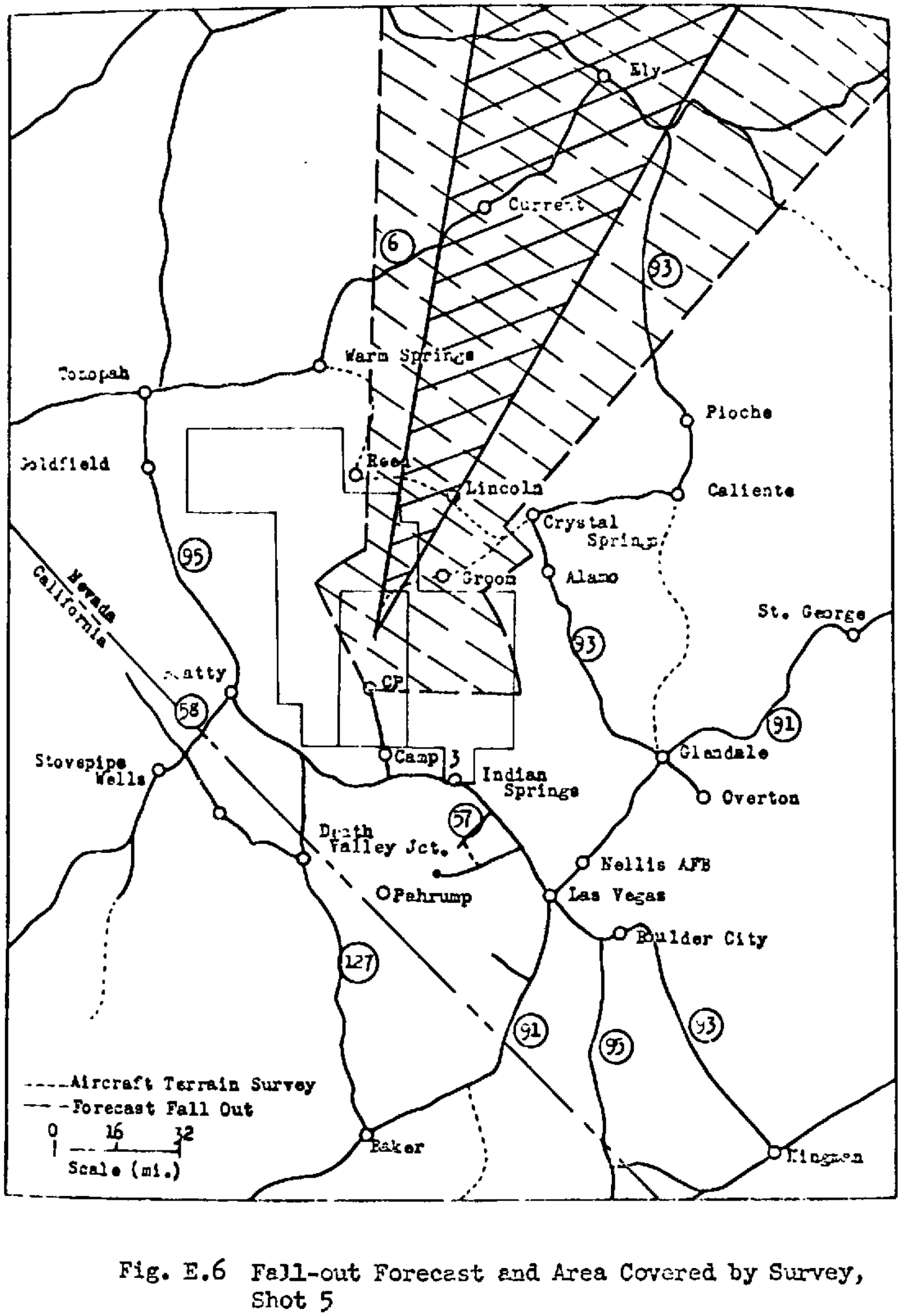
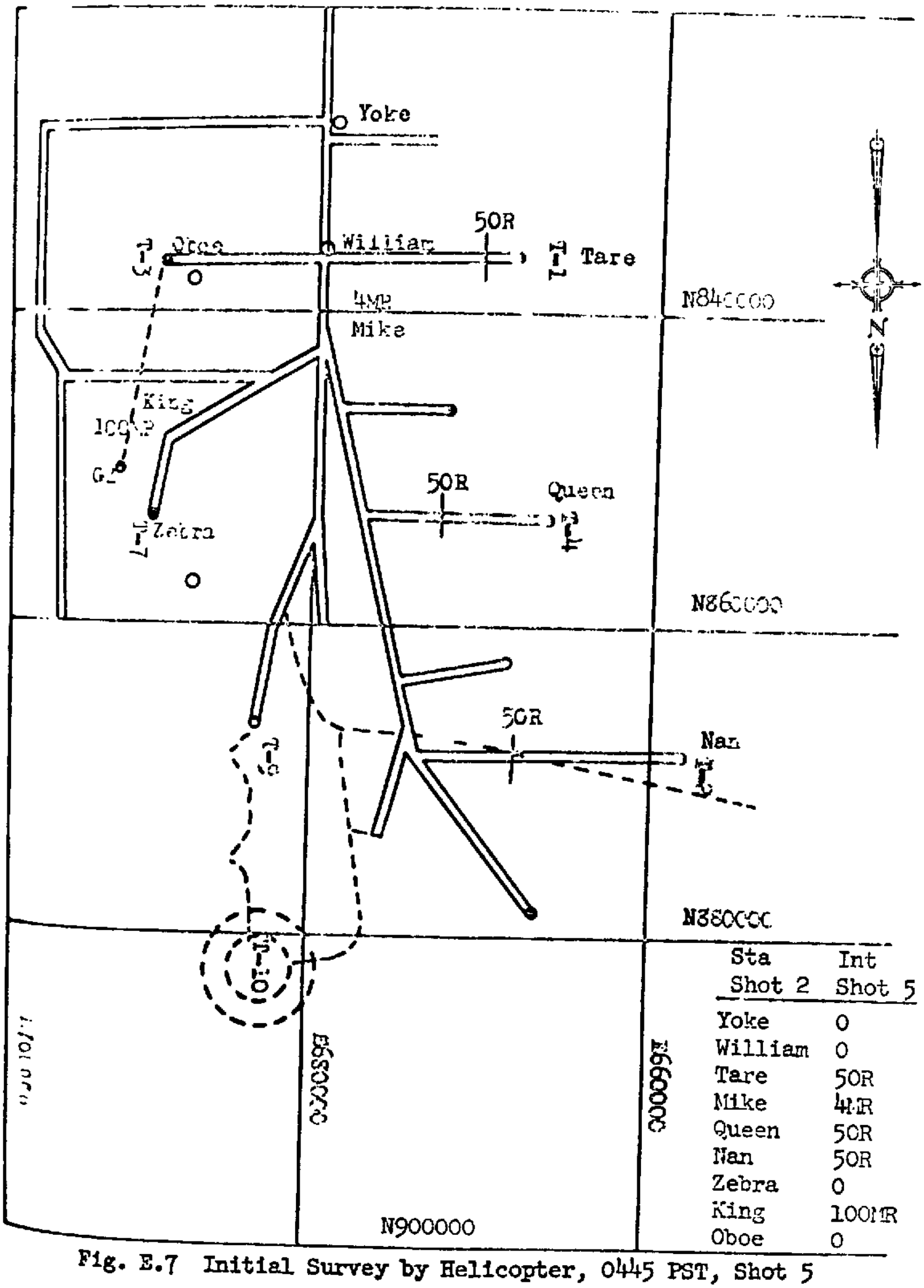


Fig. E.6 Fall-out Forecast and Area Covered by Survey, Shot 5



Sta Shot 2	Int Shot 5
Yoke	0
William	0
Tare	50R
Mike	4MR
Queen	50R
Nan	50R
Zebra	0
King	100MR
Oboe	0

Fig. E.7 Initial Survey by Helicopter, 0445 PST, Shot 5

TABLE E.6

Monitor's Survey Report - Shot 5, 7 May 1952

Stake No.	INTENSITY 7 May 52 Mr/Hr	Time	8 May 52 Mr/Hr	Time	9 May 52 Mr/Hr	Time	12 May 52 Mr/Hr	Time	13 May 52 Mr/Hr	Time
GZ									17,000	
301							5,050	0450	4,000	0500
302			10,000	1323			3,500	0449	1,500	0500
303							1,020	0448	200	0500
304	10,000	0539	1,000	1322			600	0447	44	0500
305					10,000	1322	80	0446	24	0500
306					1,000	0502	18	0445	18	0500
307					100	0501	10	0444	4	0500
308	1,000	0536	100	1321	40	0500	3	0443	3	0500
309	500	0536			22	0459	2	0442	2	0500
310	300	0535			10	0458			1	0500
311	140	0535	10	1320	6	0459				
312	60	0534			4.6	0446				
313	54	0532			2.6	0455				
314	42	0531								
315	22	0530								
316	10	0530								
317	5.2	0529								
318	5	0528								
319	4	0527								
320	2.4	0526								
321	2	0525								
322	2	0524								
323	2	0523								
324	1.4	0522								
336									1,400	0500
337			10,000	1330			5,010	0450	280	0500
338					10,000	0521	1,020	0451	100	0500
339							200	0454	[illegible]	[illegible]

TABLE [illegible] (Cont'd.)

Stake No.	7 May 52 Mr/Hr	7 May 52 Time	8 May 52 Mr/Hr	8 May 52 Time	9 May 52 Mr/Hr	9 May 52 Time	12 May 52 Mr/Hr	12 May 52 Time	13 May 52 Mr/Hr	13 May 52 Time
340							100	0456	22	0500
341			1,000	1330	1,000	0519	54	0458	12	0500
342	10,000	0542			260	0518	14	0449	6	0500
343	2,000	0542			120	0517	7	0500	3	0500
344	1,000	0543	100	1326	100	0516	5	0501	2	0500
345	500	0543			32	0515	2	0502		
346	220	0544			18	0512				
347	150	0545			10	0510				
348	100	0546	10	1325	8	0525				
349	44	0546			6	0528				
350	38	0547			5	0530				
351	18	0549			2	0531				
352	10	0550								
353	3	0551								
354	2	0552								
355	2	0553								
356	1	0554								
372					10,000	0535			2,000	0500
373					8,000	0534	1,050	0523	460	0500
374			10,000	1313	3,000	0533	150	0522	100	0500
375					1,800	0532	120	0521	42	0500
376			1,000	1312			70	0520	30	0500
377	12,000	0555			500	0530	28	0519	14	0500
378	4,200	0554			200	0529	15	0518	4	0500
379	2,600	0553			110	0528	10	0517	3	0500
380	1,500	0551	100	1310	50	0527	3	0516		
381	1,000	0550			30	0526	2	0515		
382	360	0549			16	0525				
383	200	0548			10	0524				
384	140	0547	10	1307	7	0522				
385	100	0546			3.4	0521				

TABLE [illegible] (Cont'd.)

Stake No.	INTENSITY									
	7 May 52		8 May 52		[illegible] May 52		12 May 52		13 May 52	
	Mr/Hr	Time	Mr/Hr	Time	Mr/Hr	Time	Mr/Hr	Time	Mr/Hr	Time
386	35	0546			2	0520				
387	24	0545			1	0519				
388	17	0544			1	0518				
389	12	0543			1	0518				
390	10	0543			1	0518				
391	3	0543								
392	2	0542								
393	1.5	0542								
394	1	0541								
409							1,500	0524	1,000	0500
410			10,000	1326	10,000	0608	580	0525	100	0500
411							300	0526	38	0500
412					500	0608	100	0527	20	0500
413	10,000	0615	100	1325	250	0605	23	0528	12	0500
414	2,000	0615			10	0601	14	0529	4	0500
415	1,000	0616					9	0532		
416	800	0617	100	1323	110	0603	5	0533		
417	400	0618			50	0600	2	0535		
418	290	0619			10	0601				
419	160	0620								
420	80	0622	10	1319						
421	44	0623								
422	30	0623								
423	18	0624								
424	9	0625								
425	6	0625								
426	2.8	0626								
427	2	0626								
428	1	0627								
440	5	0639								
441	5	0640								

TABLE E.6 (Cont'd.)

Stake No.	Intensity									
	7 May 52		8 May 52		9 May 52		12 May 52		13 May 52	
	Mr/Hr	Time	Mr/Hr	Time	Mr/Hr	Time	Mr/Hr	Time	Mr/Hr	Time
442	5	0641								
443	5	0642								
444	5	0643								
445			10,000	1315	10,000	0544	3,500	0555	1,400	0500
446							1,050	0554	160	0500
447					2,400	0544	420	0553	40	0500
448					1,000	0543	130	0552	20	0500
449			1,000	1310	420	0542	36	0551	12	0500
450					160	0541	12	0550	6	0500
451							10	0548	5	0500
452			100	1305	60	0541	4	0547	3	0500
453					28	0540	2	0546		
454					12	0539				
455					10	0538				
456			10	1300	4.5	0537				
460					1	0535				
481			10,000	1335			5,000	-	8,000	0636
482							1,000	-	800	0637
483					10,000	0605	320	-	200	0638
484					2,000	0604	100	-	32	0639
485					1,000	0604	30	-	12	0640
486					420	0603	13	-	6	0641
487			1,000	1330	100	0602	8	-	3	0642
488					43	0601	3.2	-		
489			100	1325	32	0600				
492			.1	0556						
517									6,000	0512
518									6,000	0513
519			(10r)	0620					600	0514
520			800	0615					220	0515
521									60	0516

TABLE [illegible] (Cont'd.)

Stake No.	INTENSITY									
	7 May 52		8 May 52		9 May 52		12 May 52		13 May 52	
	Mr/Hr	Time	Mr/Hr	Time	Mr/Hr	Time	Mr/Hr	Time	Mr/Hr	Time
522									30	0517
523			650	0613					26	0518
524			500	0612			38	-	22	0519
525							40	-	32	0520
526							100	-	100	0521
527			(2r)	0610			180	-	160	0522
528			4,000	0625			528	-	280	0523
529			(42r)	0626			500	-	380	0524
530			8,000	0627			700	-	608	0525
531			9,000	0630			800	-	600	0526
532			8,000	0631			790	-	600	0527
533			(7.5r)	0632	2,500	0556	650	-	500	0528
534			8,000	0635	3,200	0557	600	-	500	0529
535			(8r)	0635	3,500	0558	700	-	500	0530
536					2,000	0559	600	-	400	0531
537			(5r)	0635	2,300	0600	440	-	370	0532
538			(4r)	0635	1,800	0601	450	-	320	0533
539			(1.5r)	0635	1,500	0602	315	-	225	0534
540					1,200	0605	310	-	220	0535
541			(1r)	0636	1,800	0606	240	-	220	0536
542			(2r)	0636	1,500	0607	320	-	220	0537
543			(2r)	0636	1,000	0608	220	-	160	0538
544			(1.5r)	0637	500	0609	170	-	120	0539
545			(1.8r)	0637	800	0610	190	-	120	0540
546			(1.2r)	0638	1,000	0611	210	-	120	0541
547			(2.4r)	0638	900	0612	240	-	120	0542
548					1,000	0614	230	-	120	0543
549			(2r)	0640	900	0615	190	-	180	0544
550			(1.8r)	0641	900	0616	170	-	140	0545
551			(1.6r)	0642	500	0617	150	-	80	0546
552			(1.4r)	0643	500	0618			100	0547

TABLE E.6 (Cont'd.)

Stake No.	INTENSITY									
	7 May 52		8 May 52		9 May 52		12 May 52		13 May 52	
	Mr/Hr	Time	Mr/Hr	Time	Mr/Hr	Time	Mr/Hr	Time	Mr/Hr	Time
553							1,000	-	9,000	0509
554							265	-	4,500	0508
555			(10r)	0607	10,000	0716	260	-	1,1 50	0508
556	10,000	0650			1,000	0714	43	-	320	0503
557	6,000	0645	(1r)	0605	400	0712	18	-	20	0502
558	3,000	0645			170	0710	7	-	8	0501
559	1,500	0644			90	0709	4.6	-	3	0500
560	600	0642	119	0602	47	0708	2.1	-		
561	440	0640			28	0707				
562	220	0638			4	0706				
563	120	0636			8	0705				
564	80	0635	11	0600	4	0703				
565	45	0635			2	0702				
566	27	0633								
567	18	0632								
568	12	0630								
569	9	0629								
570	5	0627								
571	3.75	0625								
572	2.50	0623								
573	2	0622								
574	1.50	0621								
575	1	0620								
576	1	0620								

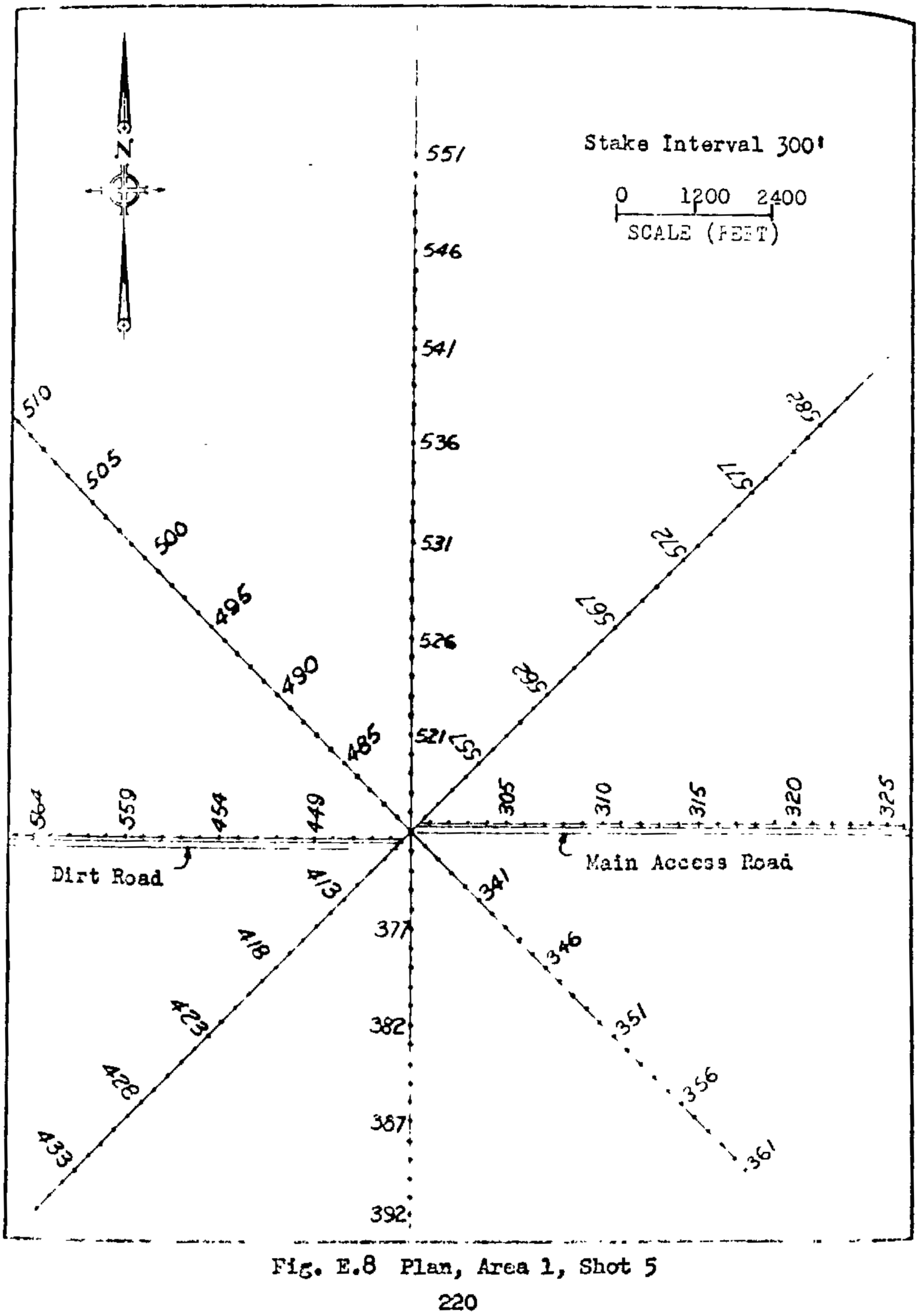


Fig. E.8 Plan, Area 1, Shot 5

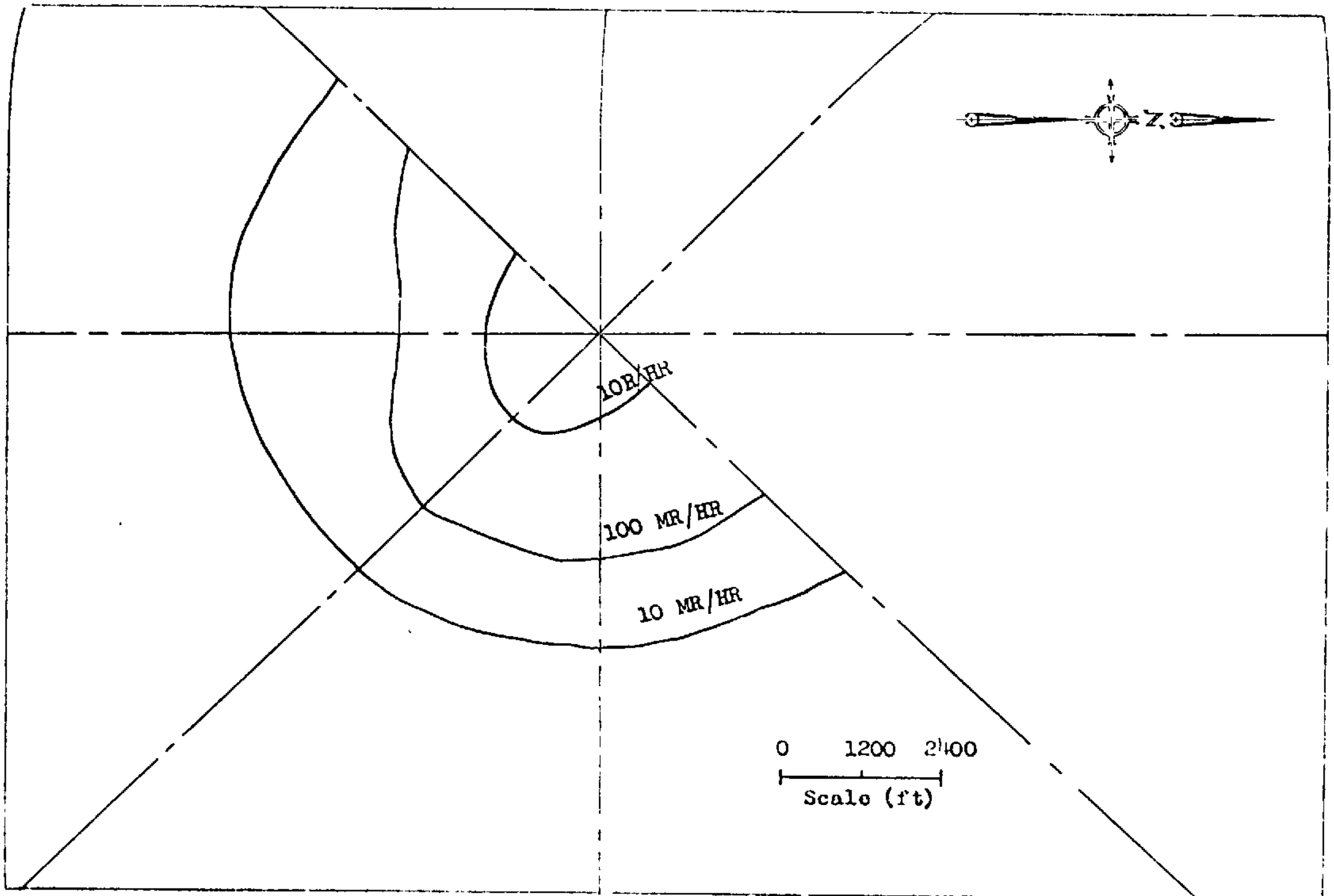


Fig. E.9 Isointensity Overlay, Shot 5, 0530 (H-Hour 0415 PST), 7 May 1952

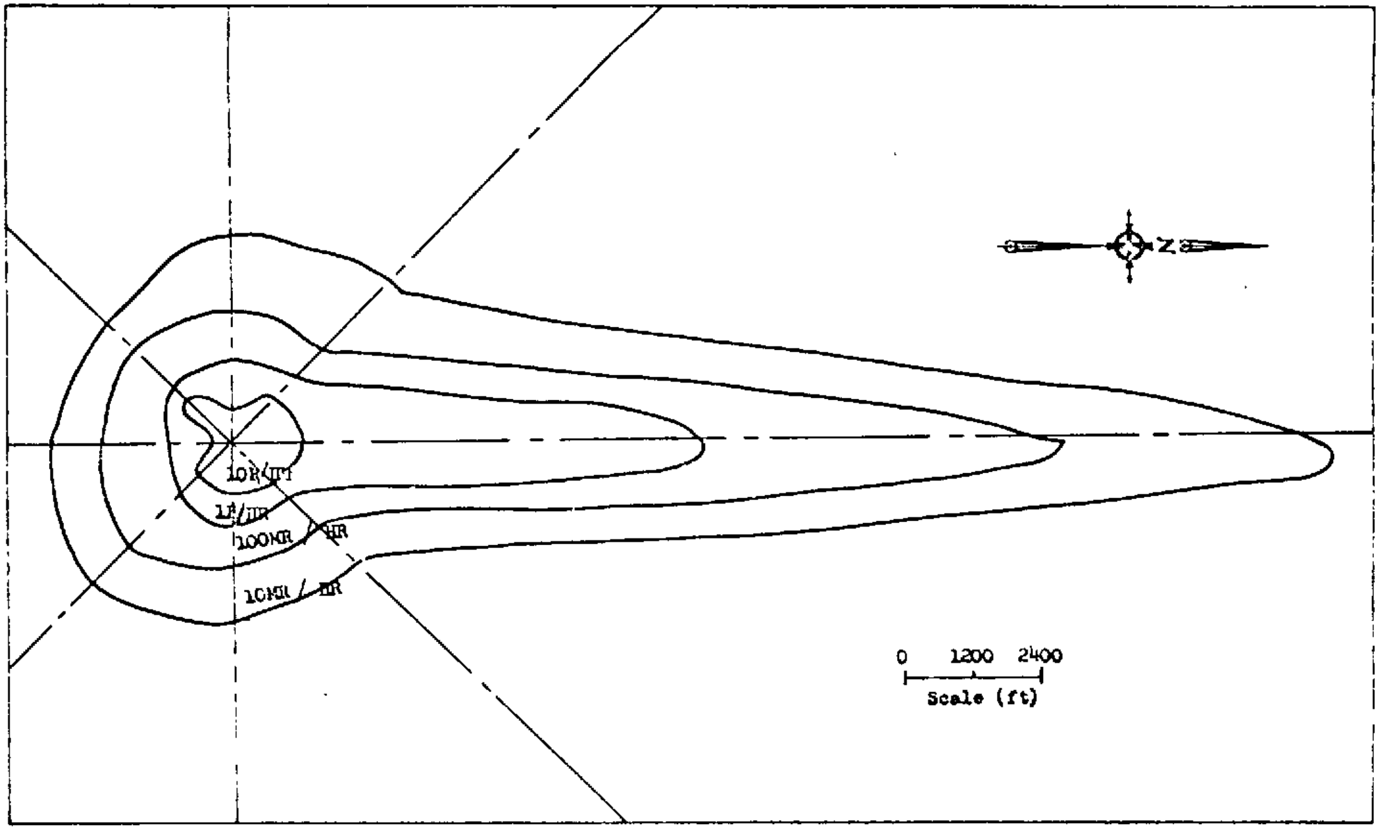


Fig. E.9.1 Isointensity Overlay, 0530, Shot 5, 9 May 1952

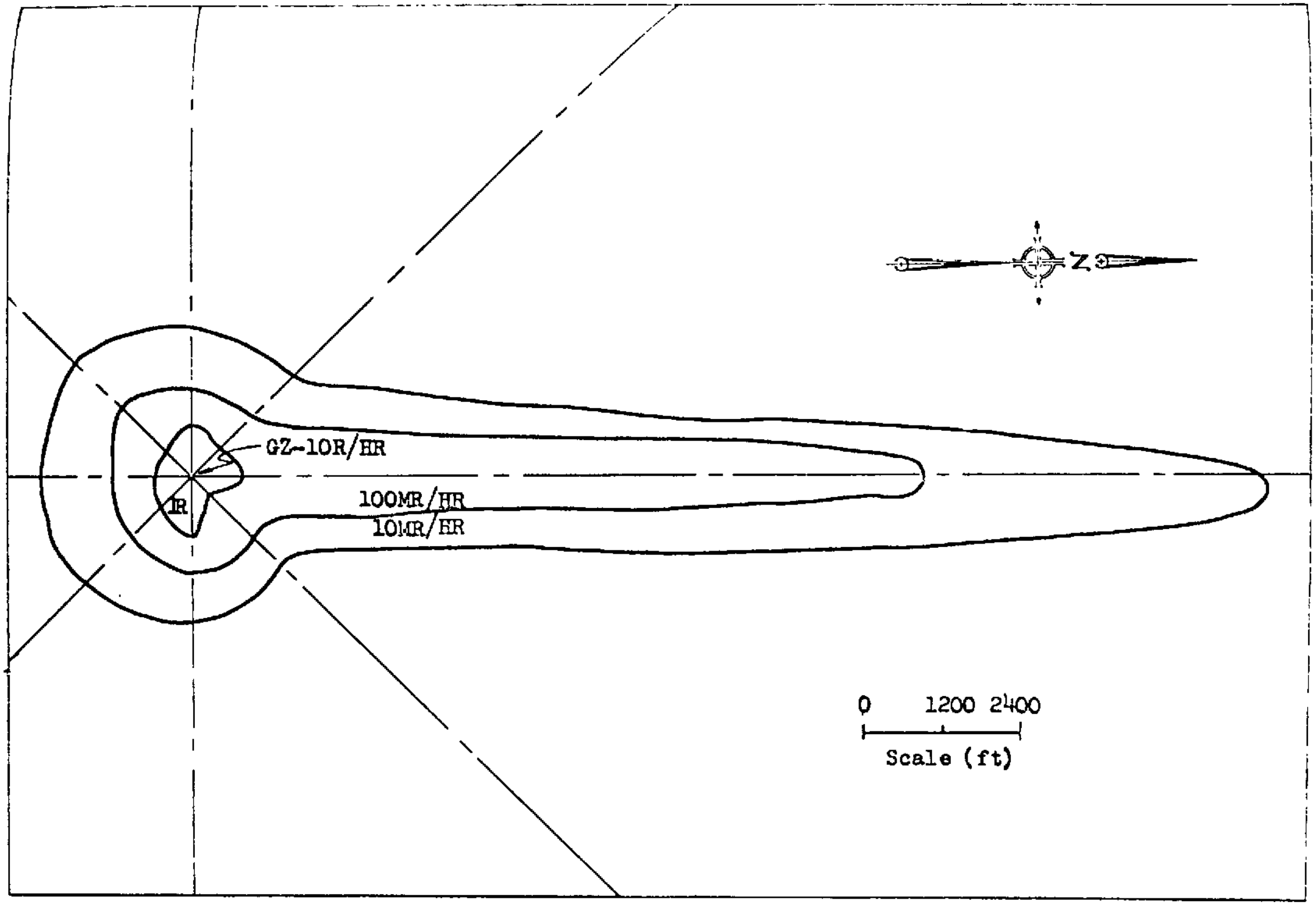


Fig. E.9.2 Isointensity Overlay, 0530, Shot 5, 12 May 1952

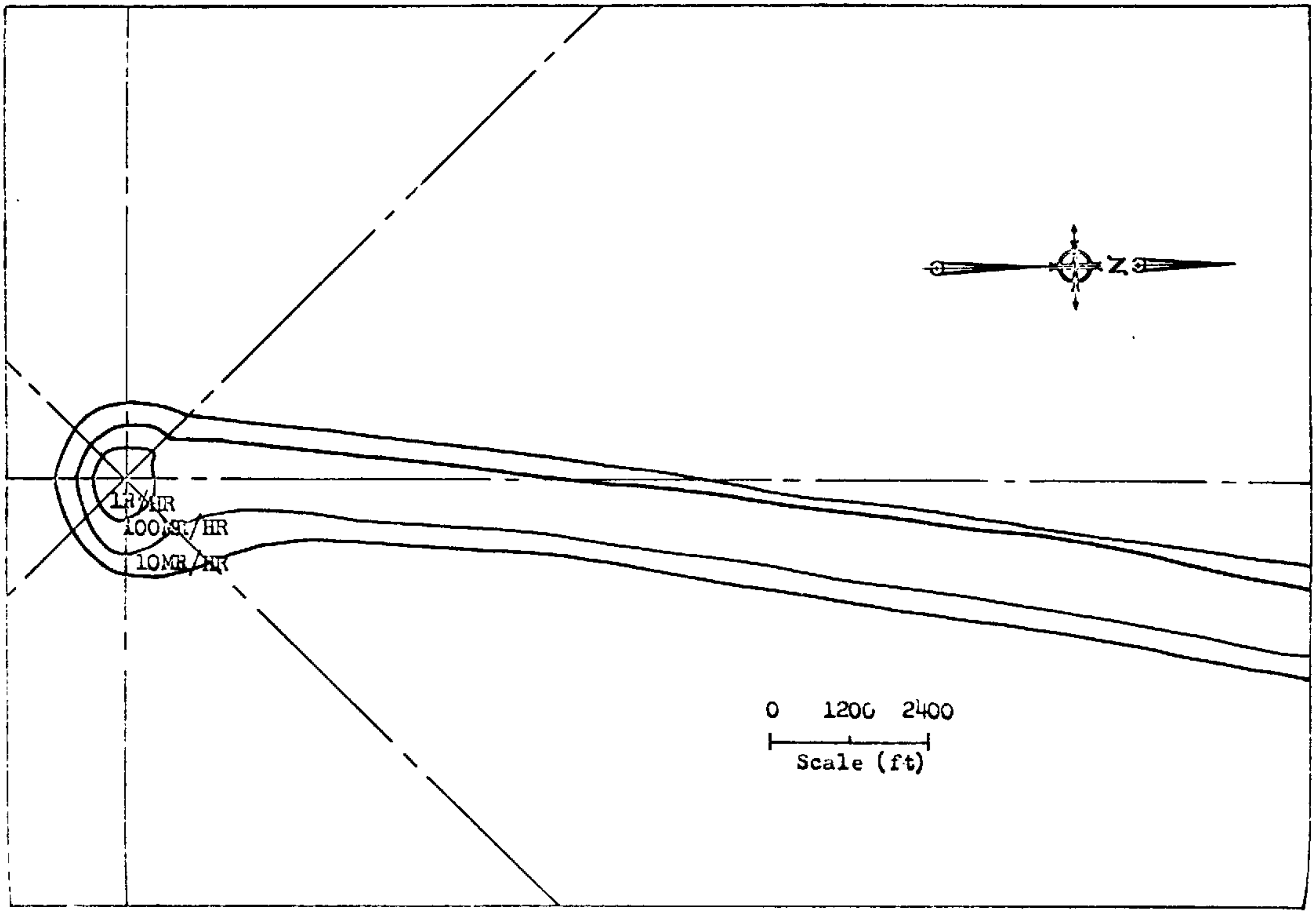


Fig. E.9.3 Isointensity Overlay, 0530, Shot 5, 15 May 1952

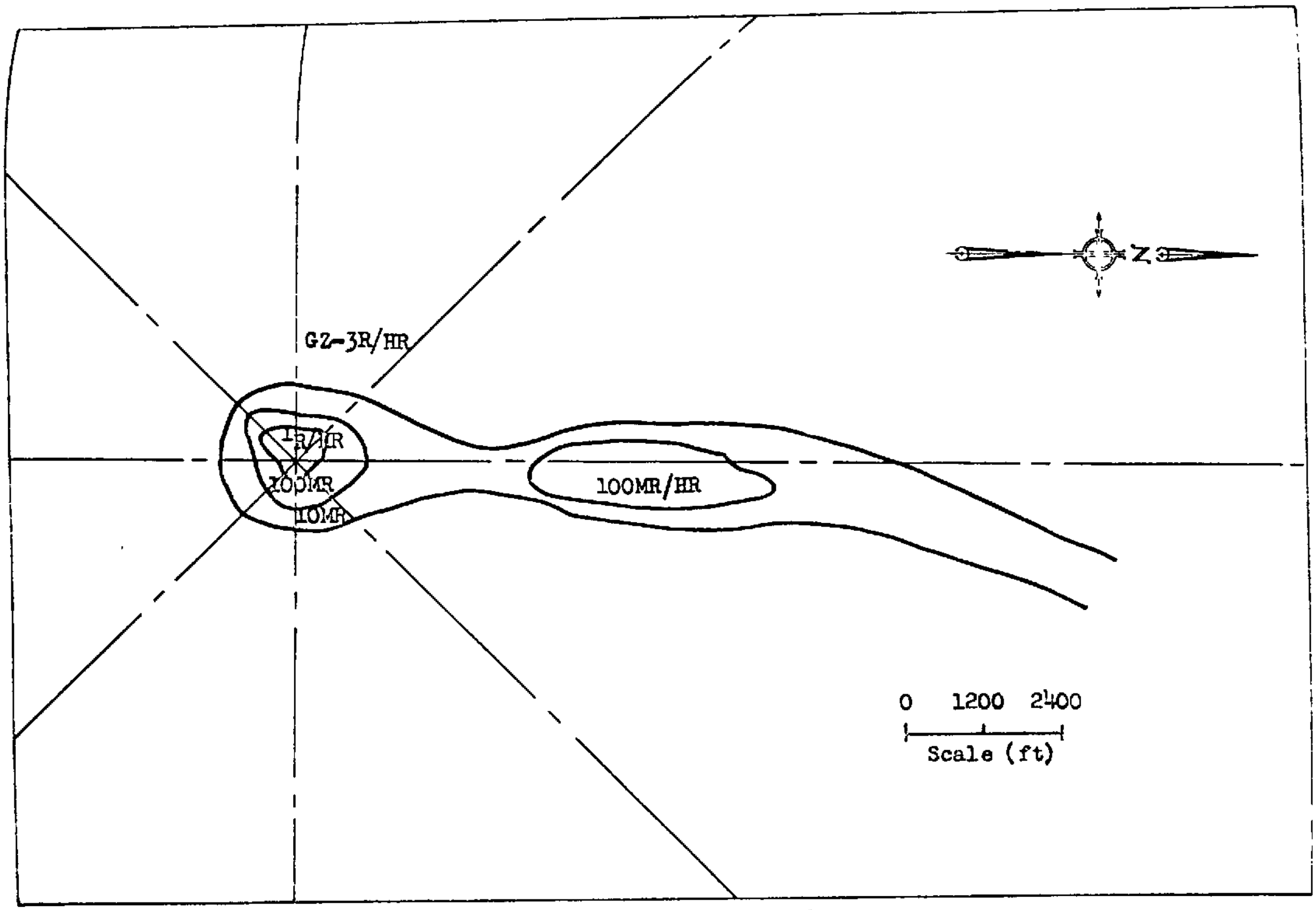


Fig. E.9.4 Isointensity Overlay, 0530, Shot 5, 23 May 1952

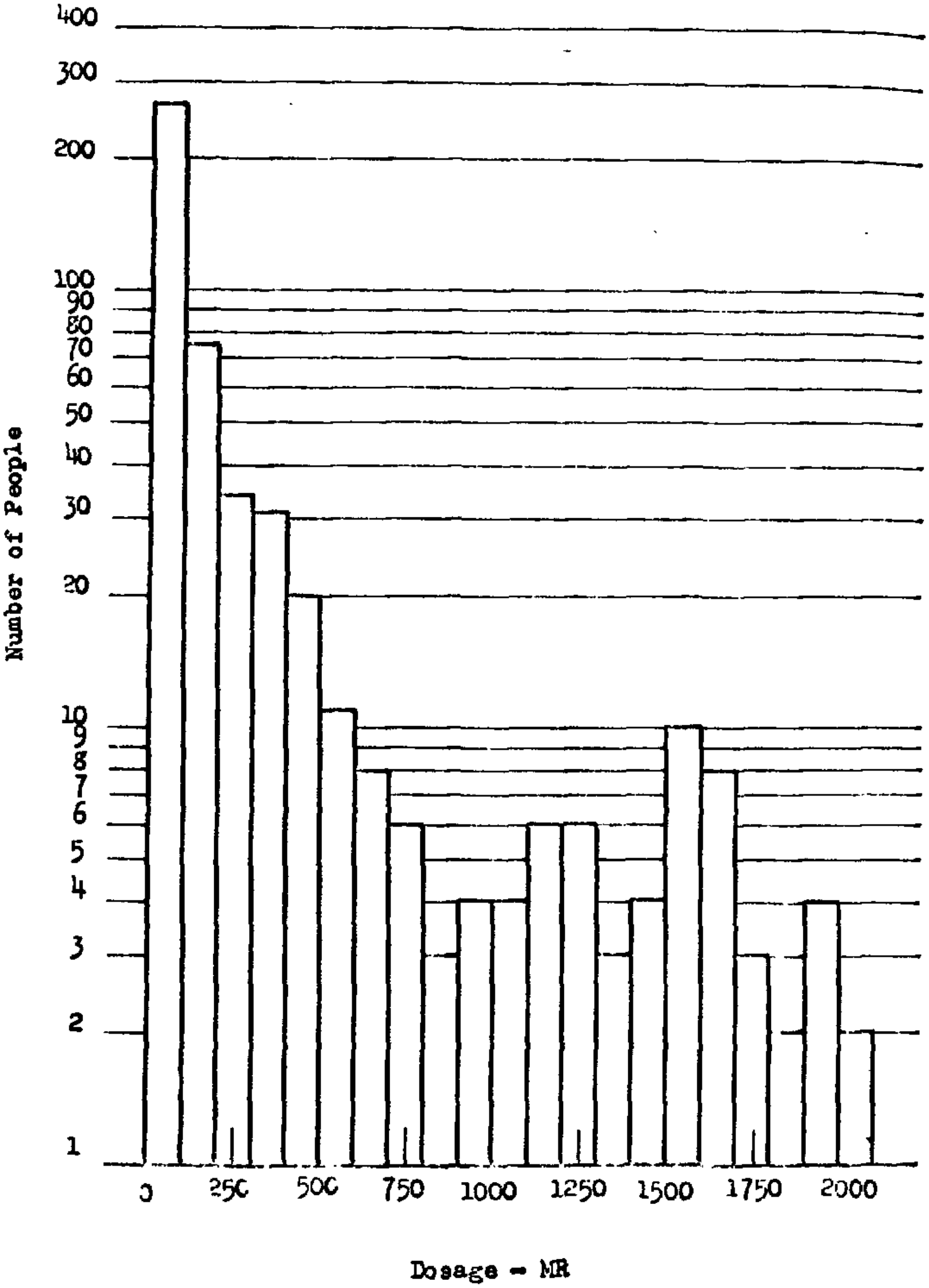


Fig. E.10 Accumulated Dose Report (For Personnel Issued Film Badges During Period E to F-1 Days)

APPENDIX F

OPERATION TUMBLER-SNAPPER
Shot 6 - 25 May 1952
(Period Covered: 25 May-31 May 1952)

OPERATIONAL DATA

Location: T-4 Area
Height of Burst: 300 ft.
Yield (KT): 11.4
Time Fired: 0359 PST

OPERATION TUMBLER-SNAPPER
Shot 6 - 25 May 1952

F.1 OFF-SITE OPERATIONS DEPARTMENT

weapon was detonated in the T-4 Area on a 3[illegible] foot tower at 0359 PST on May 25, 1952. Although significant fall-out was measured from this shot, the maximum intensities measured were lower than on the preceding tower shot (see Table F.1). The fall-out was again in the northeast quadrant, with the maximum occurring in the Groom Mine vicinity. The life-time integrated dose from Groom Mine for Shot 6 was approximately 1.8 r. During the period of active fall-out the personnel of Groom Mine were advised by the monitors to remain indoors, which reduced their dose by a factor of 2 or 3. Areas where appreciable fall-out occurred were remonitored on F+1, F+2 and F+3 Days, etc. to aid in computing the decay factors and the integrated doses. The time interval between the fifth and sixth shots was utilized by the Off-Site Operations Department to prepare data from preceding shots for the Rad-Safe Report and for further study and analysis of the fall-out phenomena. The data collected from this shot are shown in Tables F.1 through F.5 and Figs. F.1 through F.13.

F.2 MATERIEL AND LOGISTICS DEPARTMENT

The various sections under the Materiel and Logistics Department began an inventory of supplies and equipment in preparation for roll-up. 549 sets of protective clothing, 90 MX-5's and 170 T1B's were issued and used for this shot.

F.3 ON-SITE OPERATIONS DEPARTMENT

The two and one-half weeks interval between Shots 5 and 6 was utilized by the On-Site Operations Department in preparing initial drafts of their part of the Rad-Safe Report.

The isointensity lines could not be closed on F-Day because readings could not be taken along the northeast leg, where high levels of widespread contamination existed. Even though all of the isointensity lines were still not closed, the isointensity plots on E+1 and E+2 Days give a better delineation of the contaminated area. Part of the contamination from this shot overlapped the remaining residual radiation from the previous tower shot, including the JANGLE area. Annex F of the Test Director's Operational Order #1-52 scheduled 19 programs and 43 projects for participation in this shot. Due to the high levels of residual contamination, the Personnel and Vehicle Decontamination Sections had heavy work loads. The rotation of On-Site personnel to provide the required number of field monitors who had not yet accumulated their maximum of 3.0 r continued to be a necessity. The data collected by this Department are shown in Table F.6 and Figs. F.14 through F.16.

TABLE F.1

Ground Mobile Monitors' Report - Shot 6 - 25 May 1952. (See Fig. E.1). (Normal background: .02 - .04 mr/hr.)

(PST) TIME	READING Mr/Hr	GRID LOCATION (Ref.Fig. E.1)	LOCATION IN DETAIL	REMARKS
(25 May 1952)				
0400	.02	E2 S2	Groom Mine (Caliente to Pioche Area - 0545)	Background
0400	.02	F2 S4	Caliente	Background
0415	.03 - .06	F3 S5	Pioche (to Caliente Area -0455)	
0437	.01-.04	F2 S4	Caliente	Background until 1107
0455	.05	F2 S4	Caliente (to Crystal Spgs. Area	Background
0500	.02	E2 S2	Groom Mine	
0500	.02	F2 R2	15 mi. N of Pioche on US 93 (to 45 mi. N of Pioche	Background
0520	.1	E2 S2	Groom Mine	
0525	8	E2 S2	Groom Mine	
0530	10	E2 S2	Groom Mine	
0530	.06	F2 R2	45 mi. N of Pioche on US 93	
0535	30	E2 S2	Groom Mine	Light rain
0535	1	F2 R2	50 mi. N of Pioche on US 93	
0538	.2	F1 R3	52 mi. N of Pioche on US 93	
0540	1	F1 R3	54 mi. N of Pioche on US 93	
0540	110	E2 S2	Groom Mine	
0542	.2	F1 R3	60 mi. N of Pioche on US 93	
0545	140	E2 S2	Groom Mine	Rain Stopped
0545	1.7	F1 R4	65 mi. N of Pioche on US 93	
0550	155	E2 S2	Groom Mine	
0550	1	F2 R2	75 mi. S of Ely on US 93	
0600	170	E2 S2	Groom Mine	
0600	.02	E5 T2	Nellis AFB(From Nellis to Glendale (0650) to 54 mi. N of Jct US 91/93(0845)	
0605	180	E2 S2	Groom Mine	
0605	1.5	E3 S2	1/2 mi. NW of Sta. 2	
0605	.05	F2 Q0	60 mi. S of Ely on US 93 (to Ely (0635) to 55 mi. S of Ely on US 93 - 0755)	Background
0608	20	E3 S2	1.5 mi. NW of Station 2	
0610	185	E2 S2	Groom Mine	
0610	24	E3 S2	2.4 mi. NW of Sta. 2	
0612	14	E3 S2	3.4 mi. NW of Sta. 2	
0615	190	E2 S2	Groom Mine	See 0620 reading
0618	.2	E3 S3	7 mi. NW of Sta. 2	

TABLE F.1 (Cont'd.)

TIME (PST)	READING Mr/Hr	GRID LOCATION (Ref.Fig. E.1)	LOCATION IN DETAIL	REMARKS
0618	.02	E2 S4	Lincoln Mine	Background to 0745
0620	150	E2 S2	Groom Mine (Checked Instrument Setting)	Chg. from 190 to 150 mr/hr
0625	160	E2 S2	Groom Mine	Maximum reading here
0628	1.4	E3 S3	Jct. Rt. #25 & New Rd. to Lincoln Mine	
0630	155	E2 S2	Groom Mine	
0632	1	E3 S3	3 mi. N of Jct Rt. 25/new road	
0635	150	E2 S2	Groom Mine	
0635	103-105	F2 S4	Crystal Springs (to Caliente - 0740)	Background
0640	145	E2 S2	Groom Mine	
0645	140	E2 S2	Groom Mine	
0650	130	E2 S2	Groom Mine	
0700	1.5	E4 S3	Crystal Spgs.	
0700	21	E2 S3	5.6 mi. NW Sta. 2	
0704	7	E4 S3	Crystal Spgs.	
0706	57	E2 S3	4.6 mi. NW Sta. 2	
0709	100	E2 S3	4 mi. NW Sta. 2	
0710	8	E4 S3	Crystal Spgs.	
0710	125	E2 S2	Groom Mine	
0711	200	E2 S3	3.3 mi. NW Sta. 2	
0712	10	E4 S3	Crystal Spgs.	
0714	225	E2 S3	2.7 mi. NW Sta. 2	
0715	20	E4 S3	Crystal Spgs.	
0716	60	E2 S3	1.8 mi. NW Sta. 2	
0716	22	E4 S3	Crystal Spgs.	
0718	28	E4 S3	C rystal Spgs.	
0720	38	E4 S3	Crystal Spgs.	
0722	4	E2 S3	Sta. 2	
0725	40	E4 S3	Crystal Spgs.	
0726	42	E4 S3	Crystal Spgs.	
0727	46	E4 S3	Crystal Spgs.	
0730	60	E4 S3	Crystal Spgs.	
0735	140	E2 S2	Groom Mine	
0739	14	E2 S3	4.2 mi. NE of Sta. 2	
0740	60	E4 S3	Crystal Spgs.	
0740	135	E2 S2	Groom Mine	
0740	.05	F3 S3	Caliente	
0742	22	E2 S3	4.7 mi. Ne of Sta. 2	

TABLE F.1 (Cont'd.)

TIME (PST)	READING Mr/Hr	GRID LOCATION (Ref.Fig.E.1)	LOCATION IN DETAIL	REMARKS
0745	65	E4 S3	Crystal Spgs.	Maximum reading
0745	44	E2 S3	6.7 mi. NE of Sta. 2	
0745	.05	F2 S3	2 mi. W of Caliente	
0745	15	E4 R2	Jct US 93/Nev 38	
0750	120	E4 S2	Groom Mine	
0750	48	E4 S3	Crystal Spgs.	
0753	90	E2 S4	10.6 mi. NE of Sta. 2	
0800	100	E2 S2	Groom Mine	
0800	1.5	F2 S3	14 mi. W of Caliente	
0800	48-50	E4 S3	Crystal Spgs.	
0800	.06	F2 R5	60 mi. S of Ely on US 93	
0803	.5	F1 S4	16 mi. W of Caliente (and for 8 mi. W of this point)	
0805	.1	E2 S4	Lincoln Mine	
0805	1.4	F2 R4	65 mi. S of Ely on US 93	
0810	1.7	F2 R3	80 mi. N of Pioche on US 93	
0810	1.7	F2 R3	80 mi. N of Pioche on US 93	
0810	48	E4 S3	Crystal Spgs.	
0812	90	E4 S3	Hiko	
0812	1	F1 S3	26 mi. W of Caliente on US 93	
0815	90	E2 S2	Groom Mine	
0815	48	E4 S3	Crystal Spgs.	
0815	1.5	F2 R3	85 mi. N of Pioche on US 93	
0815	5	F0 S3	30 mi. W of Caliente	
0817	11	F0 S3	32 mi. W of Caliente	
0818	11-15	F0 S3	33 mi. W of Caliente	
0818	10	F0 S3	34 mi. W of Caliente	
0820	7	F0 S3	38 mi. W of Caliente	
0820	.15	E2 S4	Lincoln Mine	
0822	5	E5 S3	39 mi. W of Caliente	
0825	7	E5 S3	40 mi. W of Caliente	
0830	.6	E2 S4	Lincoln Mine	
0830	70	E2 S2	Groom Mine	
0830	40	E4 S3	Crystal Spgs.	
0845	.8	E2 S4	Lincoln Mine	
0845	80	E2 S2	Groom Mine	
0850	22	E4 S2	12 mi. W of Crystal Spgs.	
0850	2	E5 R0	22 mi. N of Crystal Spgs on Nev 38	
0855	03-.04	E4 S3	61.3 mi. N of US 91 on US 93 (to 13 mi. N)	
0900	40	E4 S3	Crystal Spgs.	
0900	40	E2 S3	15 mi. W of Crystal Spgs.	
0900	1.3	E2 S4	Lincoln Mine	
0900	70	E2 S2	Groom Mine	

TABLE F.1 (Cont'd.)

TIME (PST)	READING Mr/Hr	GRID LOCATION (Ref.Fig. E.1)	LOCATION IN DETAIL	REMARKS
0907	2	E2 S2	Lincoln Mine	
0915	35	E4 S3	Crystal Spgs.	
0915	60	E2 S2	Groom Mine	
0920	3	E2 S3	10 mi. E of Sta. 2	
0920	.2	E4 S3	74.1 mi. N of 91 on 93	
0920	2.3	E2 S4	Lincoln Mine	
0921	.6	E4 S3	75 mi. N of 91 on 93	
0925	.9	E4 S3	75.5 mi. N of 91 on 93	
0925	120		Sta. 3	
0926	5	E4 T3	76.6 mi. N of 91 on 93	
0927	13.5	E4 S4	77.2 mi. N of 91 on 93	
0930	3	E2 S4	Lincoln Mine	Maximum Reading
0930	30	E4 S4	Crystal Spgs.	
0935	28	E4 S4	Crystal Spgs.	
0935	1	E4 Q5	36 mi. N of Crystal Spgs on Nev 38 (to 14 mi. N of this point)	
0940	44	E4 S4	1.4 mi. W of Crystal Spgs.	
0945	50	E4 S4	2.5 mi. W of Crystal Spgs.	
0945	5	E4 S3	Sta. 2	
0945	50	E2 S2	Groom Mine	
0945	60	E2 S2	1/2 mi. S of Groom Mine	
0947	12	F3 S5	Pioche	
0951	80	E2 S2	2 mi. S of Groom Mine	
0952	16	E4 S4	4 mi. W of Crystal Spgs.	
0954	18	F3 S5	Pioche	
0955	5	E3 S4	4.5 mi. W of Crystal Spgs.	
0955	100	E2 S2	3 mi. S of Groom Mine	
1000	110	E2 S1	Sta. 22	
1000	.5	E5 S2	Alamo	
1000	26	E4 S3	Crystal Spgs.	
1000	2	E2 S4	Lincoln Mine	
1002	280	E2 S1	1/2 mi. W of Sta. 22	
1007	320	E2 S1	1.6 mi. W of Sta. 22	
1007	.2	F3 S3	Caliente	Intensity Rising
1010	.6	F3 S3	Caliente	Light rain
1015	22	E4 S3	Crystal Spgs.	
1015	240	E2 S1	2.7 mi. W of Sta. 22	
1017	1.4	F3 S3	Caliente	
1020	190	E2 S1	Sta. 29	
1021	1.5	F3 S3	Caliente	
1024	3.3	F3 S3	Caliente	
1024	120	E2 S1	1.2 mi. W of Sta. 29	

TABLE F.1 (Cont'd.)

TIME (PDT)	READING Mr/Hr	GRID LOCATION (Ref.Fig. E.1)	LOCATION IN DETAIL	REMARKS
1027	3	F3 S3	Caliente	
1030	18	E4 S3	Crystal Spgs.	
1030	2.5	E3 S3	Sta. 10	
1030	24	F3 S5	15 mi. NE Caliente	
1030	35	E4 S4	Hiko	
1032	4.5	F3 S3	Caliente	
1035	5.7	F3 S3	Caliente	
1036	6.5	F3 S3	Caliente	
1038	8	F3 S3	Caliente	
1040	8.5	F3 S3	Caliente	
1041	9	F3 S5	Pioche	
1043	9.3	F3 S3	Caliente	
1045	10.5	F3 S3	Caliente	
1045	13	E4 S3	Crystal Spgs.	
1049	11.5	F3 S3	Caliente	Maximum Intensity
1050	2.5	E2 S4	Lincoln Mine	
1052	11	F3 S5	Pioche	
1055	2.8	E2 S3	Sta. 7	
1058	10.5	F3 S3	Caliente	
1059	12	F3 S5	Pioche	
1100	10	F3 S3	Caliente	
1100	2	F0 R1	58 mi. N of Crystal Spgs on Nev 38	
1100	9	E4 S2	Crystal Spgs.	
1100	7-10	E4 S4	14 mi. E of Jct 93/38 on US 93	
1100	5	F3 R0	5 mi. E of Pioche	
1100	46	E2 S2	Groom Mine	
1104	3	E4 S4	15.6 mi. E of Jct 93/38 on US 93	
1110	6	E4 S4	17.9 mi. E of Jct 93/38 on US 93	
1110	9.5	F3 S3	Caliente	
1112	9	E5 S4	19.1 mi. N of Jct 93/38 on US 93	
1115	2	E2 S2	Lincoln Mine	
1117	15	F3 S5	Pioche	
1120	9	F3 S3	Caliente	
1120	28	E3 S3	Sta. 3	
1123	15	F0 S4	26.5 mi. E of Jct 93/38 on US 93	
1125	9.5	F3 S3	Caliente	
1128	20	F0 S4	27.5 mi. E of Jct 93/38 on US 93	
1129	15	F1 S4	30.3 mi. E of Jct 93/38 on US 93	
1135	10	F2 S4	30.8 mi. E of Jct 93/38 on US 93	
1130	8	E3 S2	Sta. 2	
1134	9	F3 S3	Caliente	
1130	3	E5 Q4	58 mi. N of Crystal Spgs. on Nev 38	Rain
1140	1.5	E2 S4	Lincoln Mine	

TABLE F.1 (Cont'd.)

TIME (PST)	READING Mr/Hr	GRID LOCATION (Ref.Fig. E.1)	LOCATION IN DETAIL	REMARKS
1140	9.5	F3 S3	Caliente	
1143	18	F3 S5	Pioche	
1145	28	E4 S3	3 mi. W of Crystal Spgs	
1145	10	F2 S4	41.4 mi. E of Jct 93/38 on US 93	
1146	9	F3 S3	Caliente	
1156	8.5	F3 S3	Caliente	
1200	6	E4 S3	Crystal Spgs.	
1200	41	E2 S2	Groom Mine	
1200	5	F0 R1	58 mi. N of Crystal Spgs on Nev 38	Intensity same to 1500. Rain stopped.
1230	40	E2 S2	Groom Mine	
1230	.4	E5 S2	Alamo	
1234	8	F3 S3	Caliente	
1242	7.5	F3 S3	Caliente	
1256	19	F3 S5	Pioche	Maximum Intensity
1300	36	E2 S2	Groom Mine	
1300	5	E4 S3	Crystal Spgs.	
1304	7	F3 S3	Caliente	
1327	6.5	F3 S3	Caliente	
1330	28	E2 S2	Groom Mine	
1350	7	F3 S3	Caliente	
1400	26	E2 S2	Groom Mine	
1400	2	E4 S3	Crystal Spgs.	
1403	18	F3 S5	Pioche	
1405	6.5	F3 S3	Caliente	
1423	6	F3 S3	Caliente	
1430	16	F3 S5	Pioche	
1445	1	E4 S3	Crystal Spgs.	
1500	.8	E4 S3	Crystal Spgs.	
1500	22	E2 S2	Groom Mine	
1500	2	F0 R1	58 mi. N of Crystal Spgs on Nev 38	
1530	21	E2 S2	Groom Mine	
1550	14	F3 S5	Pioche	
1547	5.5	F3 S3	Caliente	
1600	3	F0 R1	58 mi. W of Crystal Spgs on Nev 38	
1604	5	F3 S3	Caliente	
1620	13	F3 S5	Pioche	
1647	4.5	F3 S3	Caliente	
1700	20	E2 S2	Groom Mine	
1700	.6	E4 S3	Crystal Spgs.	
1730	.3	E5 S2	Alamo	

TABLE F.1 (Cont'd.)

[illegible]	READING Mr/Hr	GRID LOCATION (Ref.Fig. E.1)	LOCATION IN DETAIL	REMARKS
17[illegible]	4	F3 S3	Caliente	
1[illegible]	12	F3 S5	Pioche	
1[illegible]	3.5-4	F3 S3	Caliente	
1[illegible]	3.7	F3 S3	Caliente	
1[illegible]	18	E2 S2	Groom Mine	
1[illegible]	10	F3 S5	Pioche	
[illegible]942	3.3	F3 S3	Caliente	
21[illegible]	17	E2 S2	Groom Mine	
21[illegible]	3	F3 S3	Caliente	
21[illegible]	9	F3 S5	Pioche	
21[illegible]	8	F3 S5	Pioche	
22[illegible]	16	E2 S2	Groom Mine	
220[illegible]	2.7	F3 S3	Caliente	
225[illegible]	2.3	F3 S3	Caliente	
23[illegible]	15	E2 S2	Groom Mine	
(2[illegible] May 1952)				
0[illegible]	14		Groom Mine	
073[illegible]	12		Groom Mine	
0[illegible]	10		Groom Mine	
09[illegible]	1.2		Caliente	
0[illegible]	6		Pioche	
[illegible]	9		Groom Mine	
094[illegible]	5		Pioche	
095[illegible]	120		Groom Road Barricade	
101[illegible]	80		4.6 mi. N of barricade	
1013	40		5.9 mi. N of barricade	
1015	40		Sta. 14	
103[illegible]	18		Sta. 15	
103[illegible]	8		Groom Mine	
1042	1		Caliente	
1045	40		4 mi. E of Sta. 15	
105[illegible]	30		Water tank	
105[illegible]	8		Sta. 46	
110[illegible]	28		Sta. 33	
110[illegible]	10		N edge of Groom Lake	
1105	14		2 mi. NW of Sta. 33	
1105	7		Sta. 35	
111[illegible]	12		4 mi. N of Sta. 35	
1115	12		4 mi. NW of sta. 33	
112[illegible]	5		6 mi. NW of Sta. 33	
112[illegible]	6		7 mi. N of Sta. 35	
112[illegible]	4		Sta. 32	
12[illegible]	3		Johnny's Water	
122[illegible]	2		Sta. 48	

TABLE F.1 (Cont'd.)

TIME (PST)	READING Mr/Hr	GRID LOCATION (ref.fig. E.1)	LOCATION IN DETAIL	REMARKS
1225	.8		Sta. 31	
1245	.8		8 mi. NE of Sta. 31	
1250	.9		Sta. 37	
1300	1		Sta. 30	
1350	1		Sta. 44 (Reed)	
1445	.9		Sta. 41 (Windmill)	
1500	.8		Sta. 37	
1505	.9		1 mi. S of Sta. 37	
1515	1.3		4 mi. S of Sta. 37	
1530	2		7 mi. S of Sta. 37	
1535	2		9 mi. S of Sta. 37	
1540	3		10 mi. S of Sta. 37	
1545	3		12 mi. S of Sta. 37	
1555	3		Sta. 20	
1625	20		Sta. 29	
1627	16		1 mi. SW of Sta. 29	
1630	18		2 mi. SW of Sta. 29	
1633	14		3 mi. SW of Sta. 29	
1635	28		4 mi. SW of Sta. 29	
1636	32		5 mi. SW of Sta. 29	
1638	42		6 mi. SW of Sta. 29	
1640	60		7 mi. SW of Sta. 29	
1645	80		8 mi. SW of Sta. 29	
1648	80		9 mi. SW of Sta. 29	
1651	80		Sta. 17	
1655	90		1 mi. S of Sta. 17 (Groom Rd. Barricade)	
1658	110		2 mi. S of Sta. 17 (Groom Rd. Barricade)	
1700	130		Sta. 16	
1703	170		1 mi. S of Sta. 16	
1706	170		2 mi. S of Sta. 16	
1709	240		3 mi. S of Sta. 16	
1712	180		4 mi. S of Sta. 16	
(27 May 1952)				
0900	90		Groom Road Barricade	
0915	15		Sta. 4	
0920	22		Sta. 13	
0945	26		Jct. of Groom Mine Rd. and Groom Lake	
1010	6		Groom Mine	
1140	17		Sta. 22	
1142	18		1/2 mi. E of Sta. 22	
1145	16		1 mi. E of Sta. 22	
1149	8		$1\frac{1}{2}$ mi. E of Sta. 22	
1152	3		2 mi. E of Sta. 22	
1154	3		$2\frac{1}{2}$ mi. E of Sta. 22	

TABLE F.1 (Cont'd.)

TIME (PST)	READING Mr/Hr	GRID LOCATION (Ref.Fig. E.1)	LOCATION IN DETAIL	REMARKS
1157	3.5		3 mi. E of Sta. 22	
1212	21		Jct. Groom Mine Rd. and Groom Lake	
1217	6		Jct. of NW Road and Groom Lake	
1220	5		½ mi. NW of Groom Lake	
1222	3		1 mi. NW of Groom Lake	
1227	2		2 mi. NW of Groom Lake	
1230	2		3 mi. NW of Groom Lake	
1242	11		Jct. of SW Rd. and Groom Lake	
1245	12		½ mi. SW of Groom Lake	
1250	11		1½ mi. SW of Groom Lake	
1252	10		2 mi. SW of Groom Lake	
1258	11		3 mi. SW of Groom Lake	
1530	60		Groom Road Barricade	
(28 May 1952)				
0937	2		Groom Mine	
0942	3.6		½ mi. S of Groom Mine	
0944	5		1 mi. S of Groom Mine	
0946	6		1½ mi. S of Groom Mine	
0947	7		2 mi. S of Groom Mine	
0949	9		2½ mi. S of Groom Mine	
0951	11		Sta. 22	
0954	15		E. edge of Groom Lake	
1000	8		Sta. 29	
1017	8		2 mi. W of Sta. 29	
1020	10		4 mi. W of Sta. 29	
1024	20		6 mi. W of Sta. 29	
1027	30		8 mi. W of Sta. 29	
1032	38		10 mi. W of Sta. 29	
1038	40		Groom Road Barricade	

TABLE F.2

Aerial Terrain Survey Report (Badger I & II and Woodchuck II) - Shot 6 - 25 May 1952. (See Fig. A.2). (Background in A/C - .02 mr/hr.) (Code: Badger - C-47 aircraft. Woodchuck - L-20).

Report Number	Grid Position (Ref. Fig. A.2)	Time of Report (PST)	Absolute Altitude (Ft)	B-21 Meter Reading (Millivolts B.G./B.G.Cont.)	Rate Meter Reading (Counts/Min)	Geiger-Mueller Reading (Mr/Hr)
(25 May 1952)						
BADGER I						
1	1C4	0708	1000	70/70	400	Background
2	1C7	0712	1000	70/70	500	Background
3	1C6	0716	1000	70/70	450	Background
4	1C5	0714	700	70/65	600	Background
5	1C4	0725	500	70/9300	100,000	5
6	1C3½	0726	300	70/11,000	100,000	30
7	1C3	0729	1000	70/7200	100,000	5
8	1C2	0733	1000	70/3900	100,000	4
9	1C1	0738	1000	70/9000	100,000	15
10	1C0	0743	700	70/8000	100,000	10
11	4C1	0748	1500	70/4600	100,000	3
12	4C2	0751	500	70/3900	100,000	3
13	4D2	0755	1000	70/3900	100,000	3
14	4D1	0800	1000	70/3800	100,000	3
15	1D1	0804	800	70/3900	100,000	2.8
16	1D2	0810	1000	70/3600	100,000	2.6
17	1D3	0815	300	70/3500	100,000	2.4
18	1D4	0820	1500	70/3100	100,000	2.3
19	1D5	0823	500	70/3700	100,000	2.4
20	1D5	0827	100	70/2000	100,000	30
21	1D6	0829	400	70/5000	100,000	7
22	1D7	0831	500	70/8500	100,000	4.2
23	1D8	0835	500	70/6500	100,000	3.2
24	1D9	0839	500	70/3[illegible]	[illegible]	[illegible]
25	1D10	0841	5[illegible]	[illegible]	[illegible]	[illegible]

TABLE F.2 (Cont'd.)

Report Number	Grid Position (Ref. Fig. A.2)	Time of Report (PST)	Absolute Altitude (Ft)	B-21 Meter Reading (Millivolts D.C./A.C.Cont.)	Rate Meter Reading (Counts/Min)	Geiger-Mueller Reading (Mr/Hr)
26	1(D.5)11	[illegible]	100[illegible]	70/3700	Contaminated	2.[illegible]
27	1(D.[illegible])12.4	0354	500	70/3700	Contaminated	2.[illegible]
28	1E13	0357	500	70/3400	Contaminated	2.5
29	1E12	0901	500	70/3500	4,200	2.[illegible]
30	1E11	0905	1000	[illegible]/3500	6,000	[illegible]
31	1E10	090[illegible]	1000	7[illegible]/3500	6,000	2.[illegible]
32	1E9	0912	1000	3000/[illegible]000	1,500	3.[illegible]
33	1E8	0917	1000	3000/3000	No Report	4.[illegible]
34	1E7	0921	1000	3000/3800	No Report	2.8
35	1E6	0924	1000	3000/3300	No Report	2.3
36	1E5	0928	500	3000/3200	No Report	2.3
37	1E4	0933	1000	3000/[illegible]600	No Report	2.[illegible]
38	1E2	0939	1000	3000/3500	No Report	2.[illegible]
39	1E1	09[illegible]	1000	3000/3500	No Report	2.4
40	1E0	0946	1000	3000/3400	No Report	2.3
41	4E1	0951	1000	3000/3100	No Report	2.[illegible]
42	4E1.3	[illegible]954	[illegible]000	3000/3000	No Report	[illegible]
43	4F2	0959	1000	3000/3000	No Report	2
44	4F1	10[illegible]	1000	2800/[illegible]00	No Report	2
45	4F0	10[illegible]	1000	2800/2800	No Report	2
46	1F1	1011	500	2500/[illegible]00	No Report	2
47	1F2	1014	1000	2700/2700	No Report	1.9
48	1F3	1017	1000	2800/2800	No Report	1.9
BADGER II						
1	1B2	0558	10,000	1[illegible]0/9200	Over 10,000	20
2	$2B\frac{1}{2}$-$3\frac{1}{2}$	0617	10,000	940/1[illegible],000	Over [illegible],000	20
3	1C2	0723	10,000	1000/9500	Over 10,000	2[illegible]
4	$13\frac{1}{2}$C3	0734	10,000	1900/1900	Over 10,000	[illegible]
WOODCHUCK I						
1	$1\frac{1}{2}$A2	0526	10			[illegible].3

TABLE F.2 (Cont'd.)

Report Number	Grid Position (Ref. Fig. A.2)	Time of Report (PST)	Absolute Altitude (Ft)	B-21 Meter Reading (Millivolts B.G./B.G.Cont.)	Rate Meter Reading (Counts/Min)	Geiger-Mueller Reading (Mr/Hr)
2	4½A2	0546	10			.03
3	4A2	0552	200			.03
4	1A2	0606	5			1.[illegible]
5	1B4	0621	200			1.5
6	4B2	0648	10			2
7	4B½2	0652	15			2.5
[illegible]	[illegible]	[illegible]	[illegible]			.[illegible]
9	1B3	0725	10			1.[illegible]
10	1B½6	0742	50			1.2
WOODCHUCK II						
1	402	0954	200			.1
2	4½A2	0957	100			.5
3	4A2	1000	100			.[illegible]
4	4A½2	1003	50			.4
5	4B2	1006	50			.2
6	4B½3	1010	[illegible]			.3
7	4C2	[illegible]	50			.[illegible]
8	4C½2	[illegible]	5			.[illegible]
9	4D2	[illegible]	50			.2
10	4D3	1021	20			.2
11	4D4	[illegible]	20			.2
12	4C½4	1026	20			.1
13	4C4	1029	20			.2
14	4B½4	1032	50			.15
15	4B4	1036	20			.2
16	4A½4	1039	50			.2
17	4A4	1042	50			.15
18	4A½4	1045	50			.3
19	404	1048	50			.2

TABLE F.2 (Cont'd.)

Report Number	Grid Position (Ref. Fig. A.2)	Time of Report (PST)	Absolute Altitude (Ft)	B-21 Meter Reading (Millivolts B.G./B.G.Cont.)	Rate Meter Reading (Counts/Min)	Geiger-Mueller Reading (Mr/Hr)
(26 May 1952)						
BADGER I						
1	2C2	0720	500	1250/1250		0
2	2C0	0727	500	1250/1250		0
3	2E0	0726	500	1200/1200		0
4	3E2	0743	500	1200/1200		0
5	3D2	0748	500	1200/1200		0
6	3D3	0751	500	1200/1200		0
7	3C3	0756	500	1200/1200		0
8	3A5	0808	500	1200/1200		0
9	3A6	0813	500	1300/1300		.1
10	4A6	0820	500	1250/1250		0
11	4C4	0830	500	1250/1250		0
12	4D0	0845	1000	1250/1650		.1
13	1D1	0850	1000	1250/1400		.2
14	1C3	0856	500	1250/2500		.6
15	1C5	0904	1000	1250/1250		0
16	2A5	0922	500	1250/1250		0
17	204	0927	500	1250/1250		0
18	2C4	0932	500	1000/1000		0
19	2C3	0937	500	1100/1100		0
BADGER II						
1	2E5	0730	3500	500/500	800	.3
2	2F5	0735	3500	500/500	800	.2
3	2G3	0741	6500	480/480	950	[illegible]
4	3G4	0810	3500	400/400	950	[illegible]
5	3F5	0815	1000	370/370	950	[illegible]
6	3C5	0823	1500	390/390	950	.2
7	3B7	0830	1500	380/380	950	.2
8	3B8	0832	1500	380/380	950	.2

TABLE F.2 (Cont'd.)

Report Number	Grid Position (Ref. Fig. A.2)	Time of Report (PST)	Absolute Altitude (Ft)	B-21 Meter Reading (Millivolts B.G./B.G.Cont.)	Rate Meter Reading (Counts/Min)	Geiger-Mueller Reading (Mr/Hr)
9	308	0842	5500	380/380	1050	.2
10	4B6	0854	5500	380/380	1050	.2
11	4D8	0911	6500	380/380	1050	.2
12	4G5	0916	7000	390/390	950	.2
13	1G3	0947	9500	800/800	950	.2
14	107	1007	7500	600/600	900	.2
15	1C9	1017	8000	600/600	950	.2
16	109	1022	7000	900/900	950	.2
17	108	1024	7000	900/900	950	.2
18	2B8	1030	5500	900/900	950	.2
19	2E5	1044	6000	900/900	1200	.3

TABLE F.3

Aerial Cloud Trackers' Report (Hounddog I & IV) - Shot 6 - 25 May 1952 (See Fig. A.2).
(Code: Hounddog - B-29 aircraft).

Report Number	Grid Position (Ref. Fig. A.2)	Time of Report (PST)	Mean Sea Level Altitude (Ft)	B-21 Meter Reading (Millivolts B.G./B.G.Cont.)	Rate Meter Reading (Counts/Min)	Geiger-Mueller Reading (Mr/Hr)
HOUNDDOG I						
1	1A3	0505	220			550
2	1C2	0517	220			64
3	4Ao	0530	240			7
4	1O1	0535	740			6
5	1A4	0545	240			12
6	1C5	0550	240			22
7	1C7	0604	240			6
8	1D7	0611	240			3
9	1C4	0620	240			8
10	1C3	0630	240			9
11	2A3	0644	24			10
12	1D8	0657	24			10
13	1I6	0713	24			10
14	1I4	0717	24			12
15	1E6	0721	24			14
16	1A3	0727	24			14
17	1D3	0732	24			10
18	1E2	0735	24			10
19	1A4	0745	24			10
20	1A6	0754	24			200
21	1B9	0800	24			10
22	1E9	0806	24			10
23	1G14	0818	24			10
24	1F13	0835	24			10
25	1C10	0843	24			20
26	1A7	0852	24			22
27	1C3	0910	24			10

TABLE F.3 (Cont'd.)

Report Number	Grid Position (Ref. Fig. A.2)	Time of Report (PST)	Mean Sea Level Altitude (Ft)	B-21 Meter Reading (Millivolts B.G./B.G.Cont.)	Rate Meter Reading (Counts/Min)	Geiger-Mueller Reading (Mr/Hr)
28	1B4	0915	24			30
29	1A6	0924	24			12
30	1A6	0945	24			13
31	1A9	0950	24			22
HOUNDDOG IV						
1	1A0	0440	9000			2
2	4A½1	0440	9000			2
3	1A0½	0502	9000			2
4	1B½1½	0505	9000			2
5	1B3	0510	9000			3
6	1B0	0525	9000			375
7	1A1	0548	14			14
8	400	0555	14			90
9	1C4	0608	13			36
10	1C½4½	0630	13			16
11	1B0	0708	9			4
12	1B1	0722	9			3

TABLE F.4

Fixed Air Sampling and Fall-out Tray Report - Shot 6 - 25 May 1952 *

CODE	STATION	AIR CONCENTRATION $\mu c/m^3$ 1 Hr.	AIR CONCENTRATION $\mu c/m^3$ 24 Hrs.	F. O. TIME AFTER H-HOUR	FALL-OUT TRAYS $d/m/ft^2$	FALL-OUT TRAYS Part/Tray	FALL-OUT TRAYS μC/Part	PARTICLE SIZE MMD	PARTICLE SIZE % <5 μ	BACKGROUND RECORDER Arrival Time	BACKGROUND RECORDER High Reading (mr/Hr)
CP	CP	52.7×10^{-3}	11.7×10^{-3}	3.5	4.76×10^{6}	-	-	1.3 4.7 4	87 50 56	3.3	.35
M	Mercury	-	7.01×10^{-3}	-	1.85×10^{6}	-	-	-	-	2.58	.044
IS	Indian Spgs	-	9.32×10^{-3}	-	23.2×10^{6}	-	-	-	-	-	Background
LV	Las Vegas	-	5.15×10^{-3}	-	11.4×10^{6}	-	-	-	-	-	Background
NA	Nellis AFB	-	4.82×10^{-3}	-	329×10^{3}	-	-	-	-	15	.035
GJ	Glendale Jct.	-	18.5×10^{-3}	-	3.3×10^{6}	-	-	-	-	10.58	.40
AL	ALAMO	81.4×10^{-3}	11.5×10^{-3}	7.5, 10.5, 14.5	1.65×10^{6}	-	-	1.7	80	8	1.25
CS	Crystal Spgs.	257×10^{-3}	41.4×10^{-3}	4, 10	486×10^{6}	-	-	-	-	3.17	off-scale Scale 5
CA	Caliente	480×10^{-3}	133×10^{-3}	6,5,10.5	258×10^{3}	-	-	-	-	6.05	1.89
PI	Pioche	778×10^{-3}	232×10^{-3}	5.5, 7.5	1.35×10^{9}	-	-	2.5	78	5	7.6
EL	Ely	-	114×10^{-6}	None	413×10^{3}	-	-	-	-	-	Background
CU	Currant	-	325×10^{-6}	-	30.0×10^{6}	-	-	-	-	-	Background
WS	Warm Spgs.	-	7.22×10^{-3}	-	2.4×10^{6}	-	-	-	-	11	.48
BE	Beatty	-	720×10^{-6}	-	11.2×10^{6}	-	-	-	-	11	.046
GM	Groom Mine	362×10^{-3}	60.4×10^{-3}	1.5, 7.5	13.1×10^{9}	-	-	3	65	1.33	190
LM	Lincoln Mine	285×10^{-3}	52.4×10^{-3}	4.5, 7.5	158×10^{6}	-	-	5.8	49	4.5	5.4
NP	20 mi.N Pioche	555×10^{-3}	85.4×10^{-3}	7.5	26.6×10^{6}	-	-	-	-	7.5	11

*See Explanatory Notes (Page 79)

TABLE F.5

Weather Data (Pibal Taken at CP) - Shot 6 - 25 May 1952

Time (PST)	Altitude in Ft. m.s.l.	Direction in Degrees	Speed in Knots
0335	Surface	330	3
	5,000	290	3
	6,000	250	6
	7,000	220	8
	8,000	230	7
	9,000	230	6
	10,000	230	9
	12,000	240	13
	14,000	230	8
	15,000	210	6
	16,000	160	6
	18,000	150	11
	20,000	200	10
	22,000	240	10
	24,000	250	21

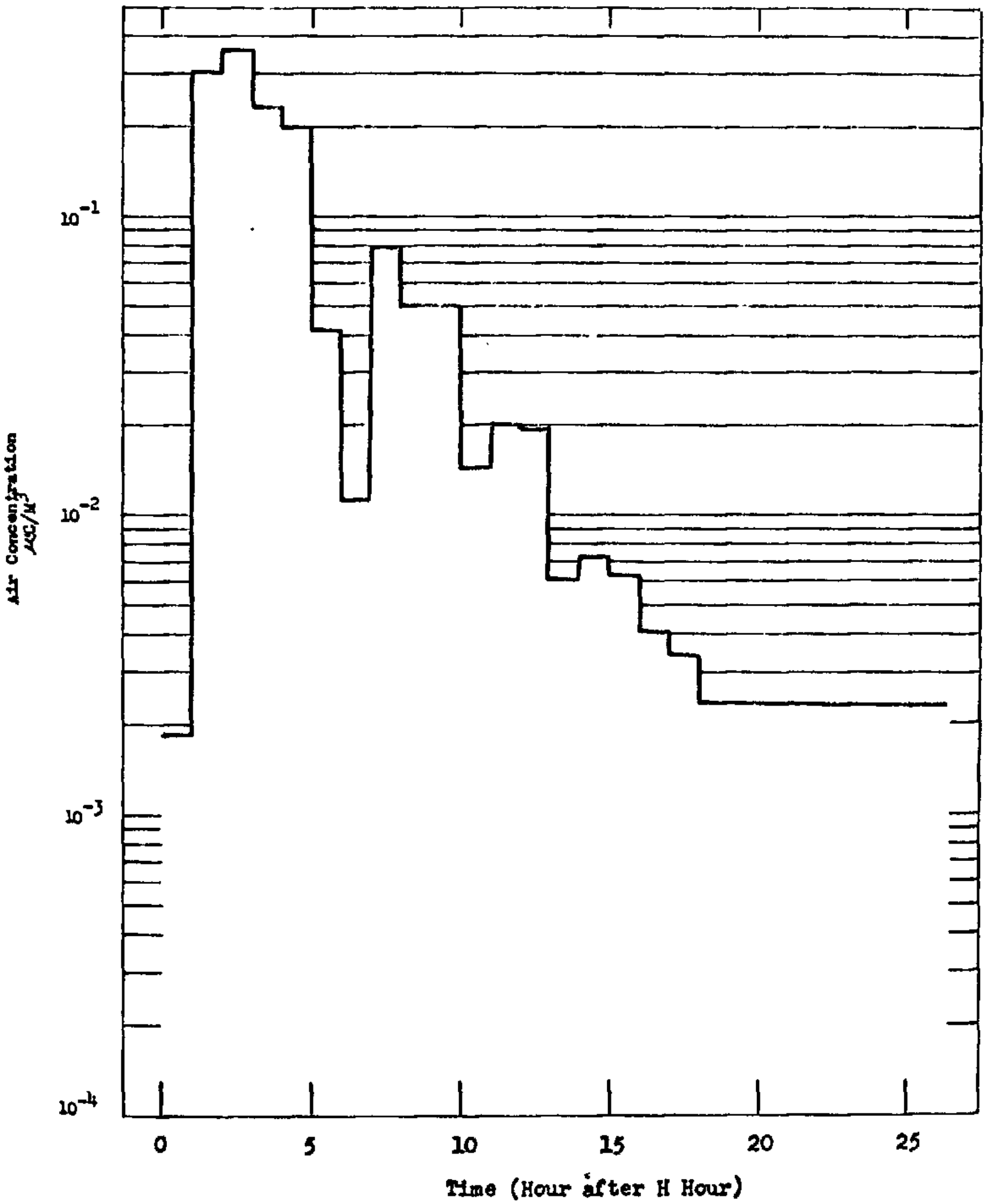


Fig. F.1 Air Radioactive Concentration vs Tire - (Groom Mine) - Shot 6 (See Table F.4)

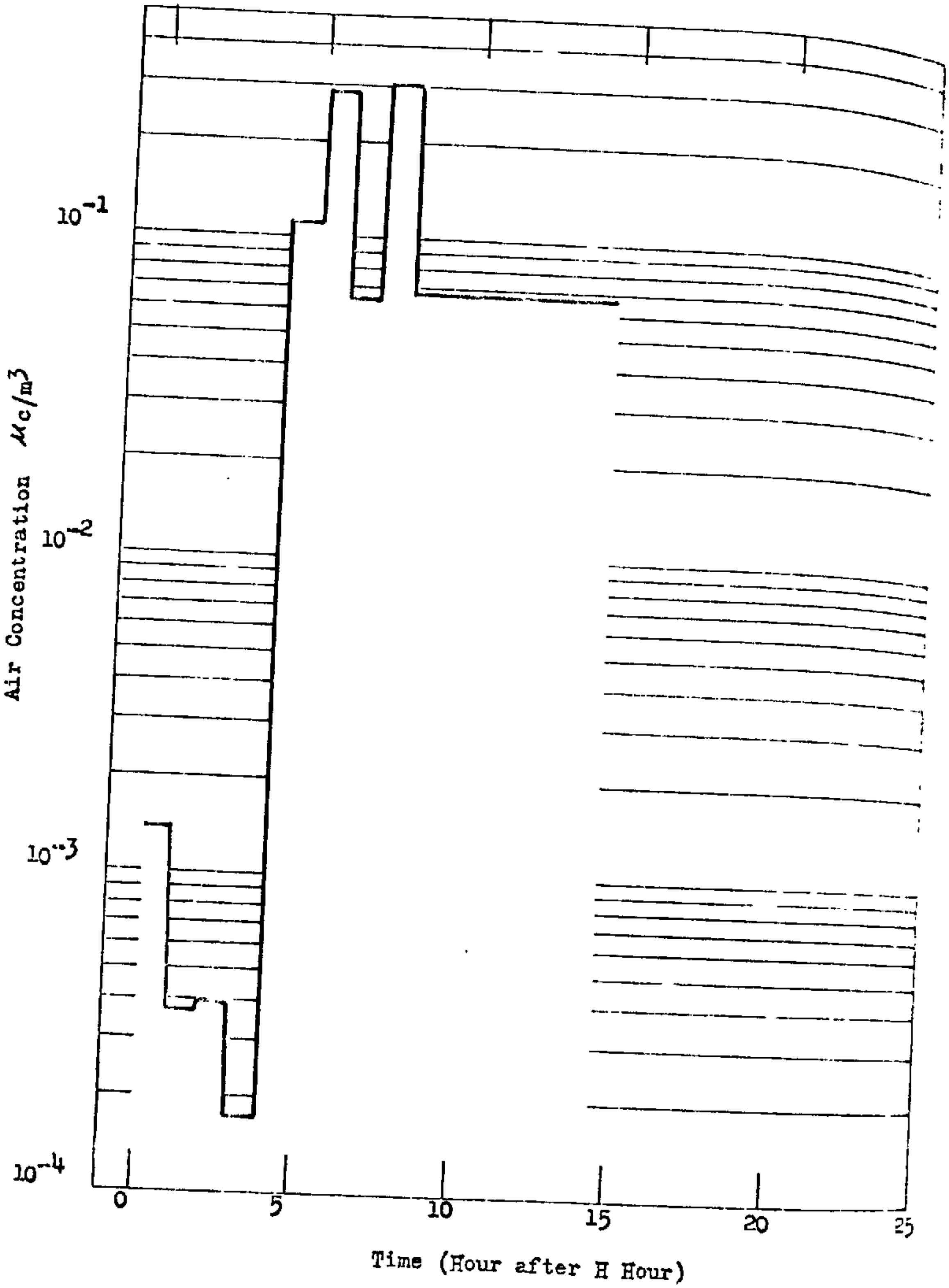


Fig. F.2 Air Radioactive Concentration vs Time - (Lincoln Mine) - Shot 6 (See Table F.4)

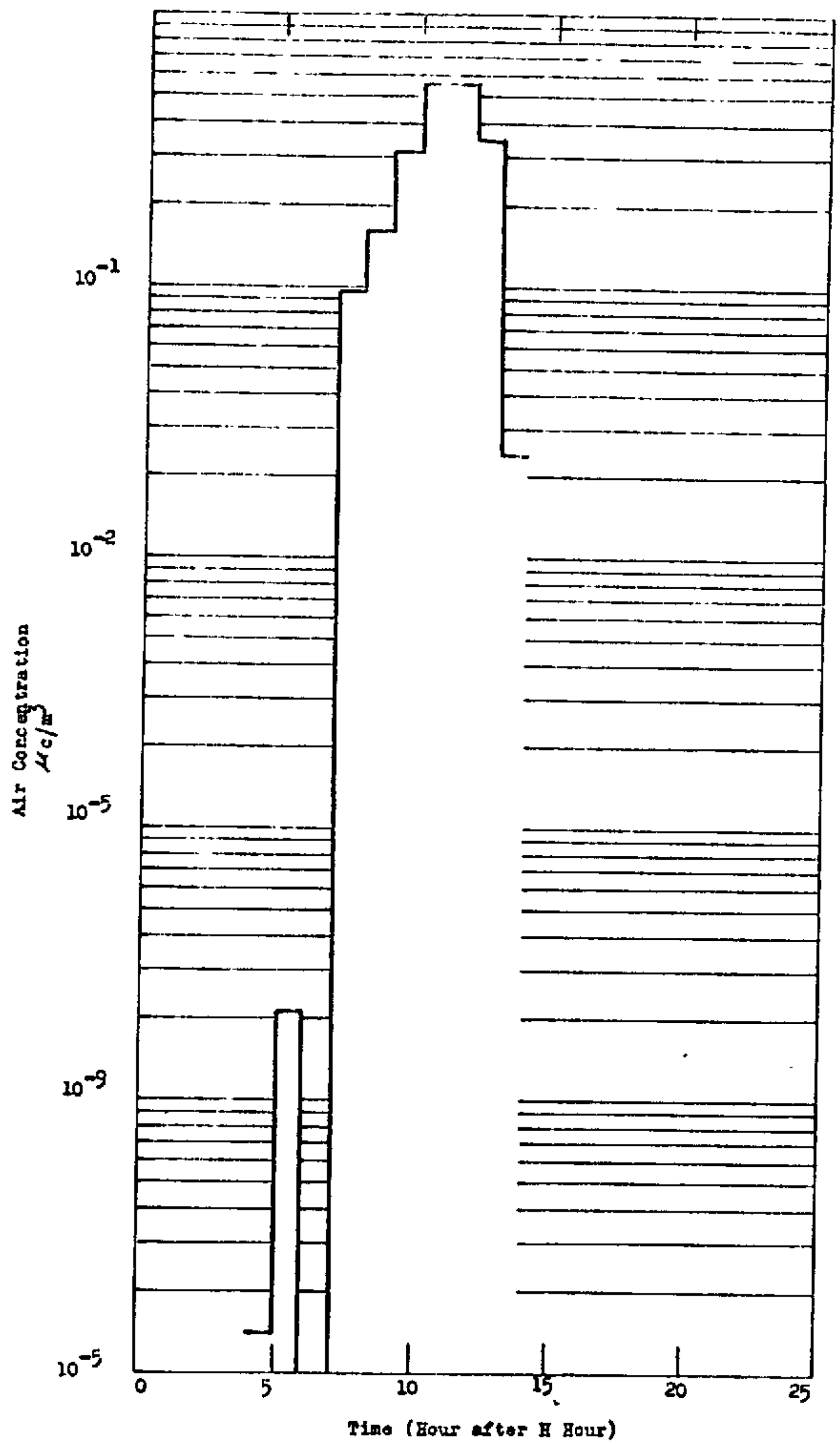


Fig. F.3 Air Radioactive Concentration vs Time (20 Mi. N. of Pioche)
Shot 6, (See Table F.4)

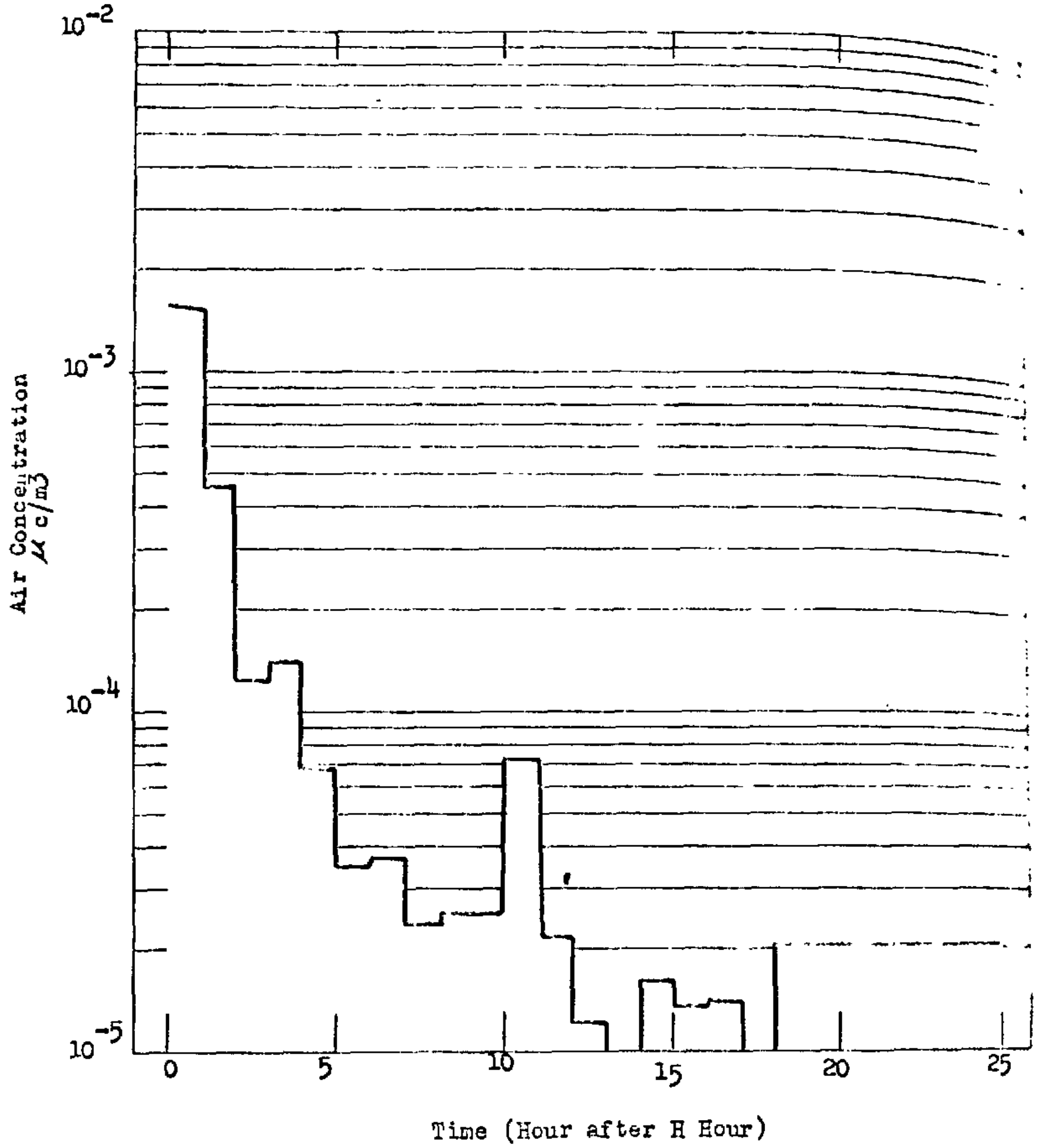


Fig. F.4 Air Radioactive Concentration vs Time - (Ely, Nevada) - Shot 6
(See Table F.4)

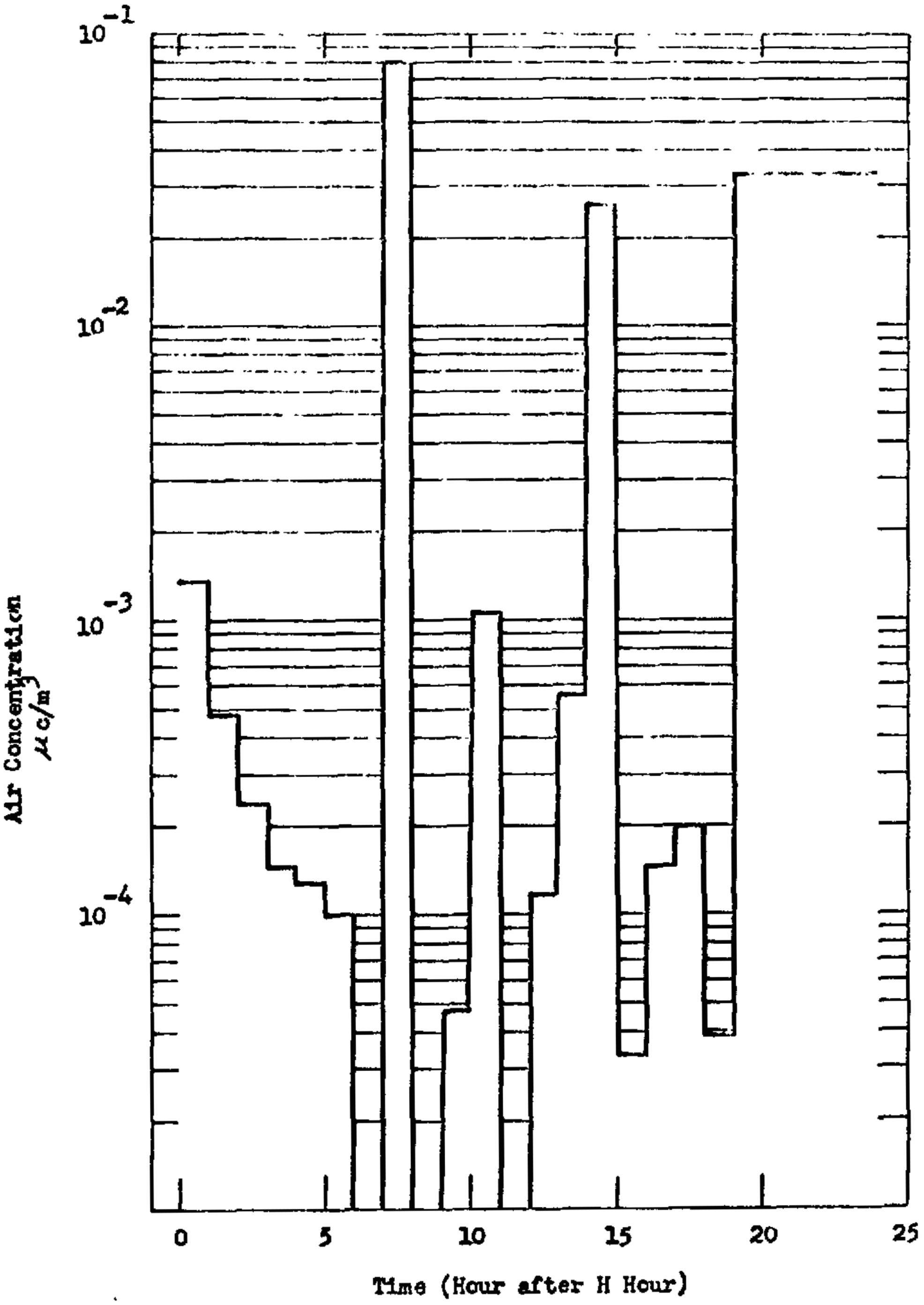


Fig. F.5 Air Radioactive Concentration vs Time - (Alamo, Nevada) - Shot 6 (See Table F.4)

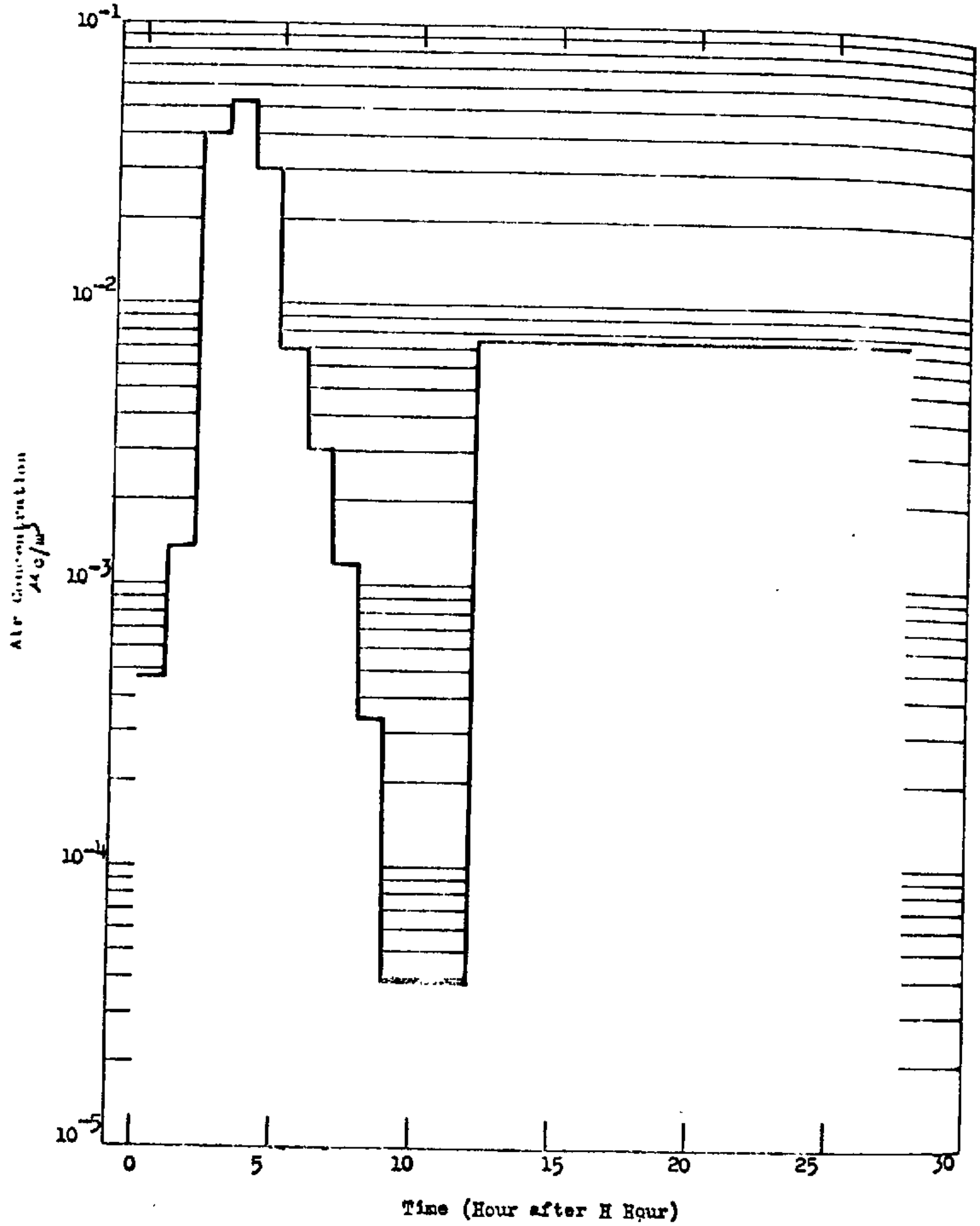


Fig. F.6 Air Radioactive Concentration vs Time - (CP) - Shot 6 (See Table F.4)

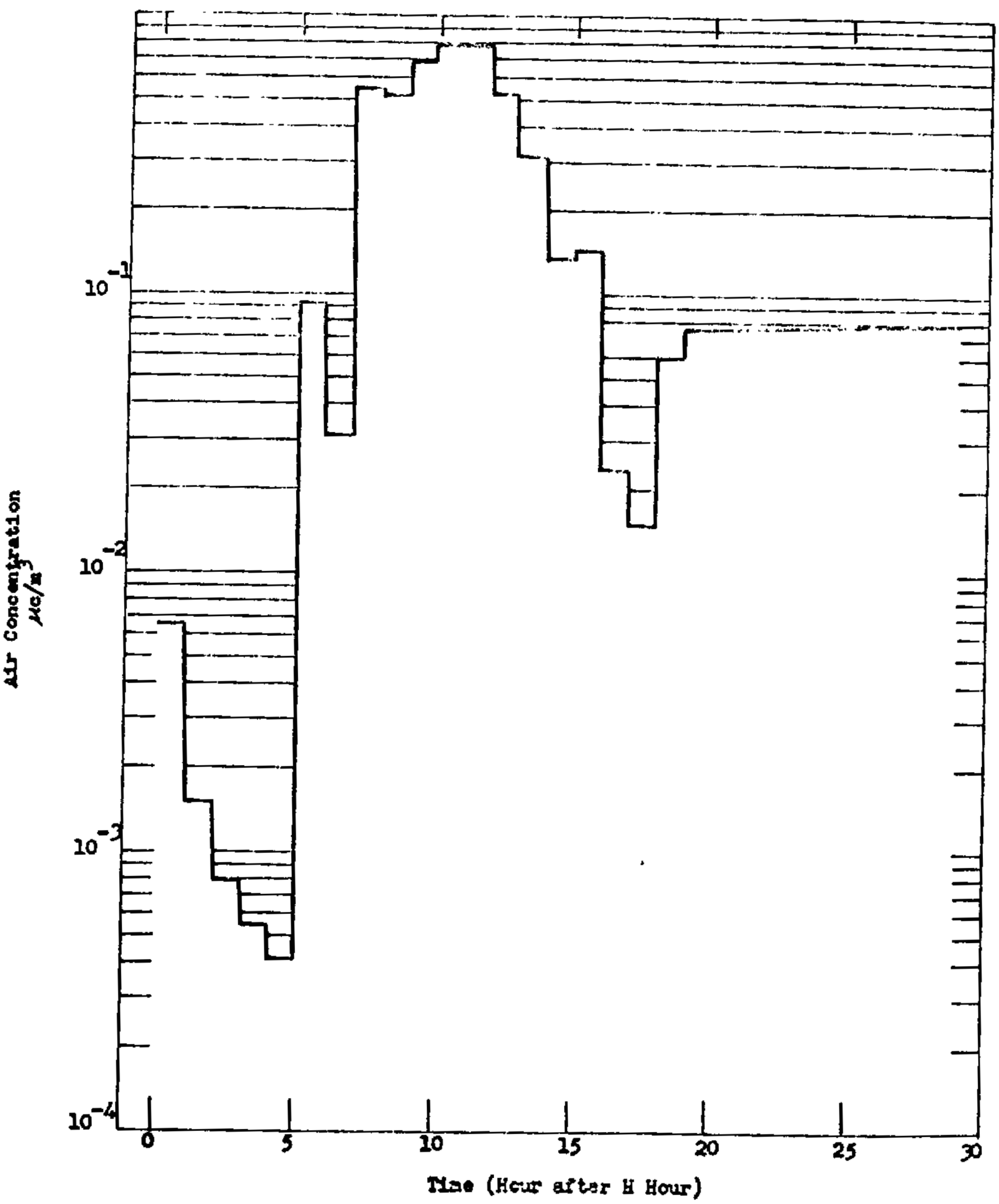


Fig. F.7 Air Radioactive Concentration vs Time - (Pioche, Nevada) - (See Table F.4)

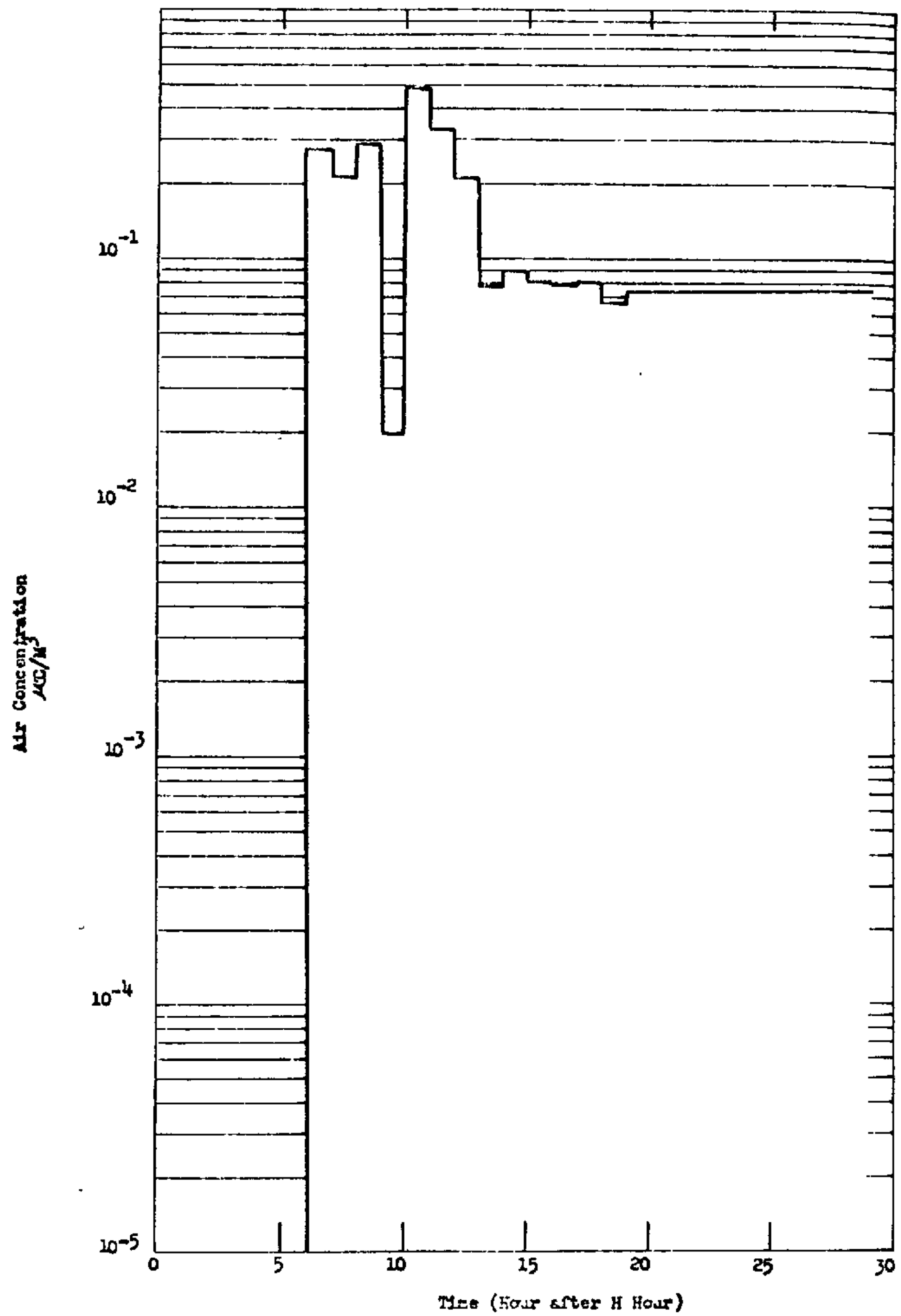


Fig. F.8 Air Radioactive Concentration vs Time (Caliente) Shot 6 (See Table F.4)

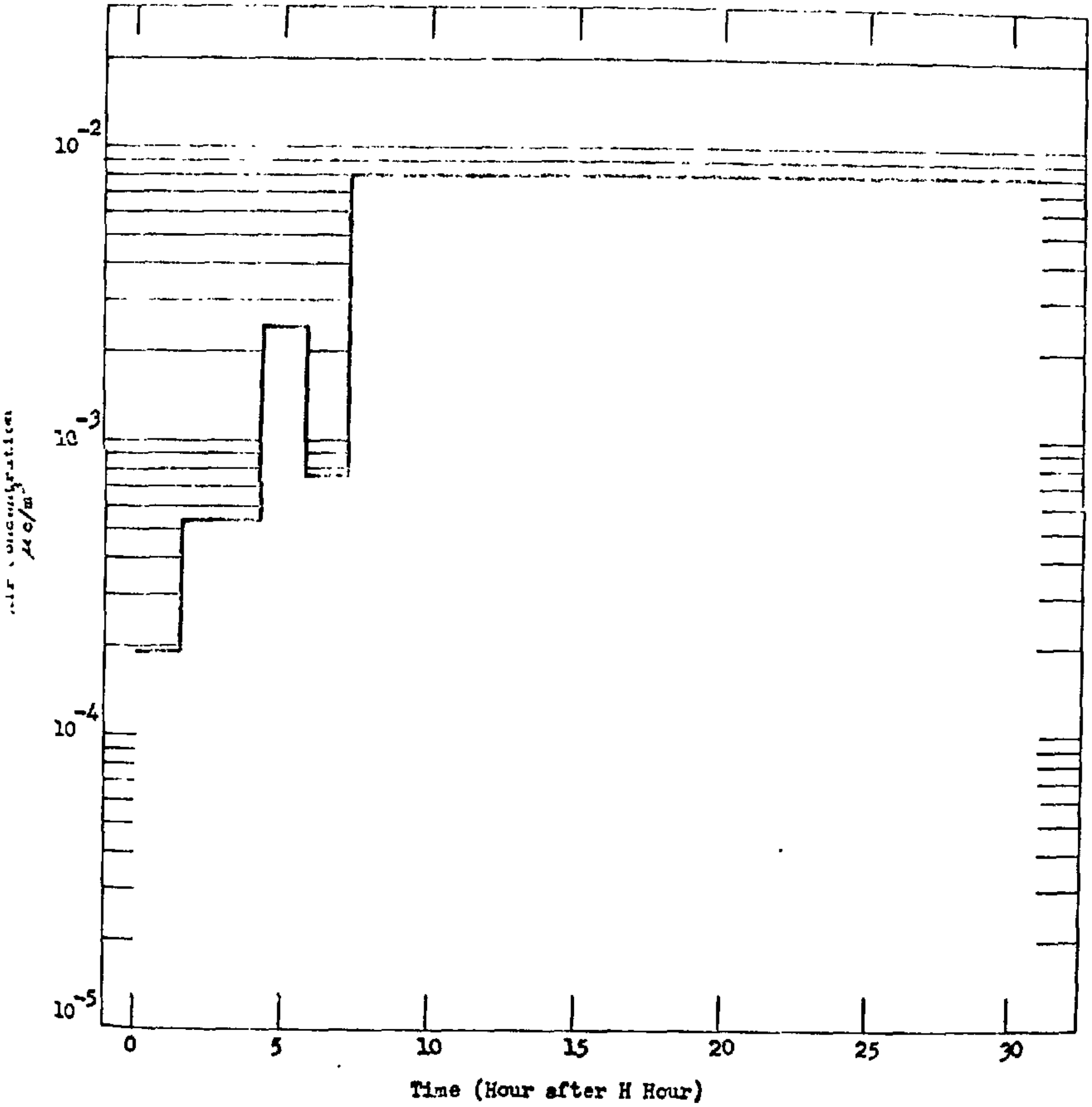


Fig. F.9 Air Radioactive Concentration vs Time (Mercury), Shot 6 (See Table F.4)

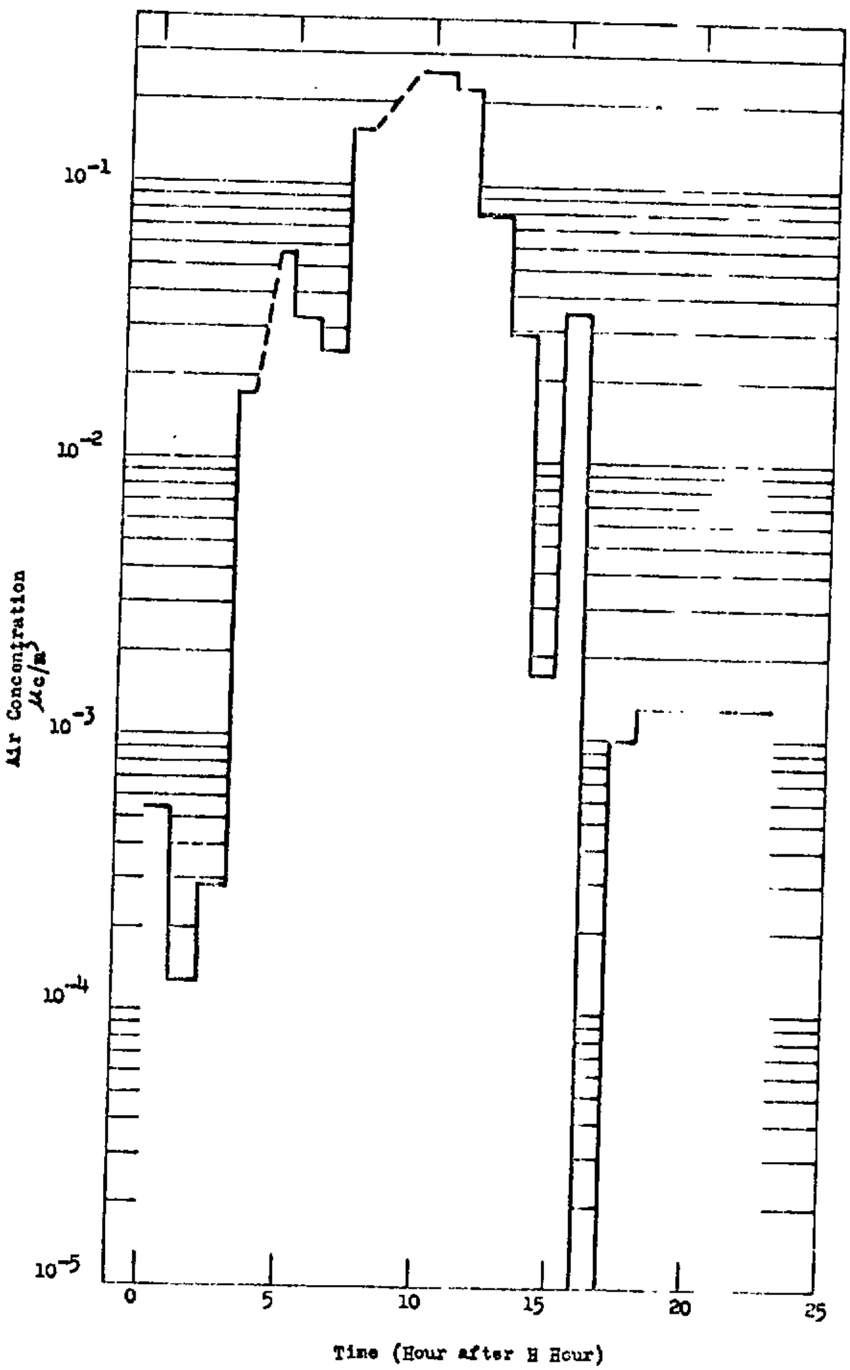


Fig. F.10 Air Radioactive Concentration vs Time (Crystal Springs), Shot 6 (See Table F.4)

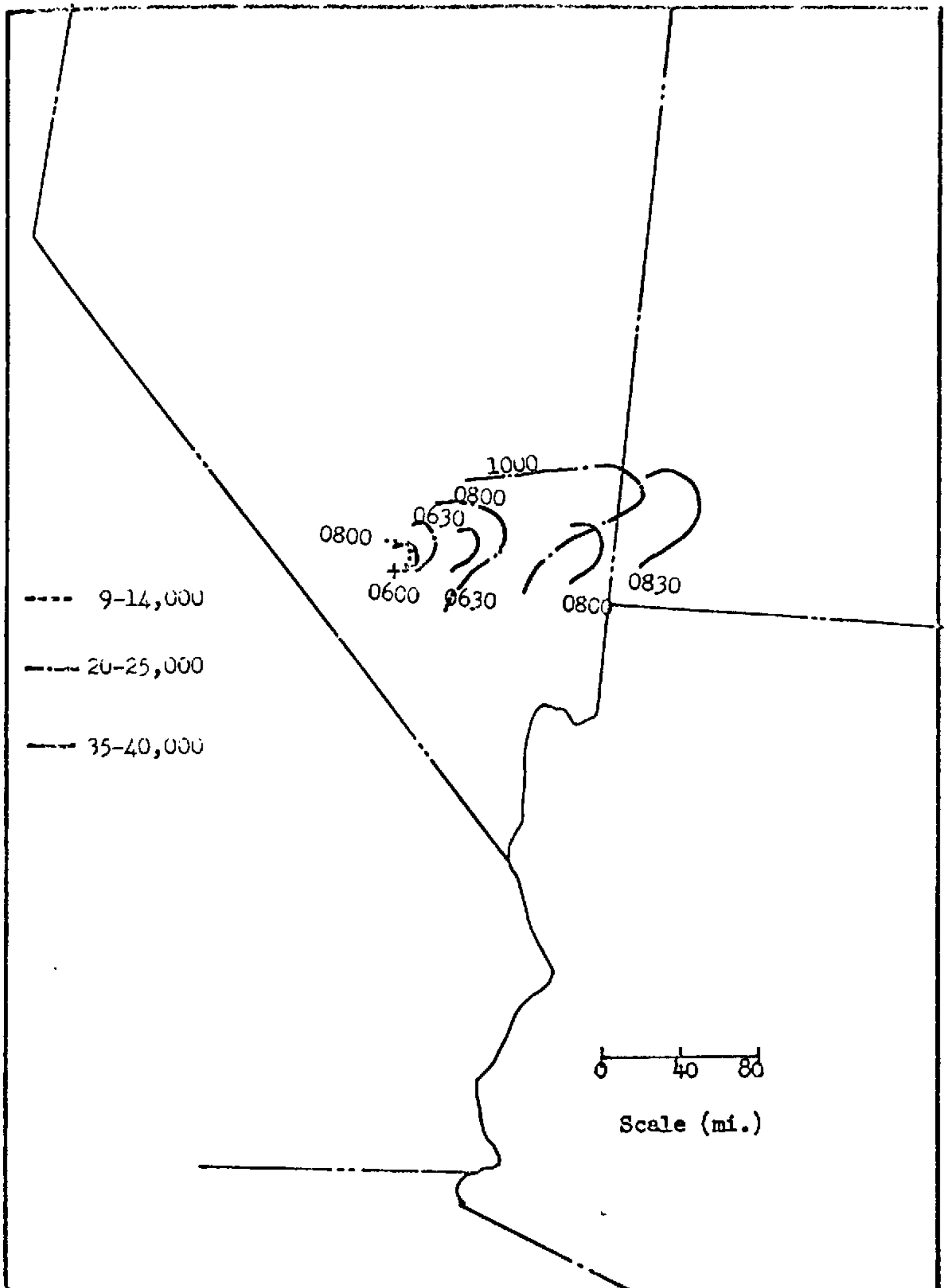


Fig. F.11 Cloud Progression, Shot 6

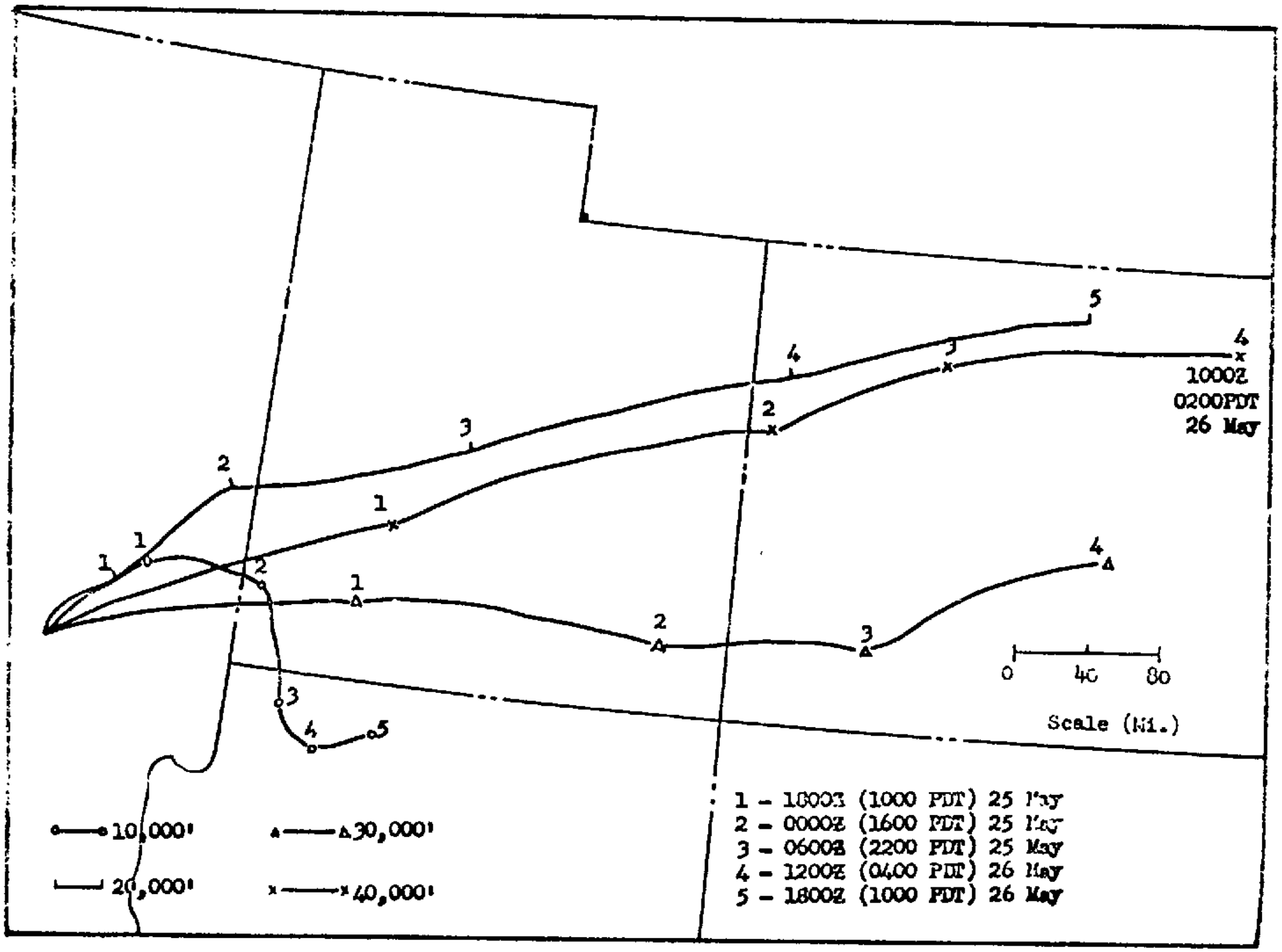


Fig. F.12 Cloud Trajectory, Shot 6

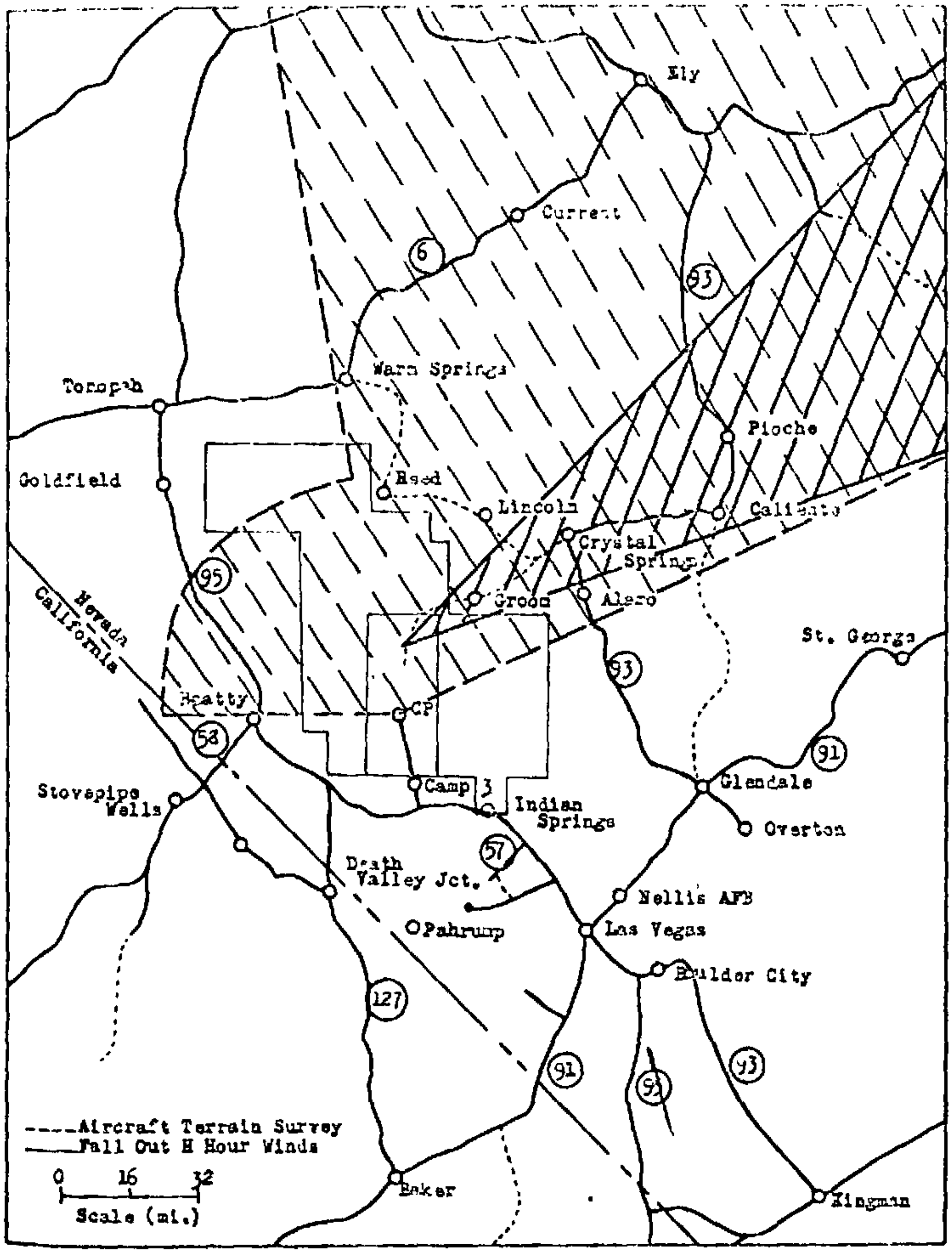


Fig. F.13 Fall-out Forecast and Area Covered by Surveys, Shot 6

TABLE F.6

Monitors' Survey Report - Shot 6 - 25 May 1952

INITIAL SURVEY - 25 May 1952

Stake No.	Intensity Mr/Hr	Time	Stake No.	Intensity Mr/Hr	Time
(E. Stake Line)					
36	10	0525	264	30	0532
35	10	0526	263	26	0533
34	10	0527	262	28	0534
33	12	0529	261	30	0535
32	14	0530	260	26	0536
31	15	0531	259	32	0537
30	20	0532	258	26	0538
29	24	0533	257	23	0539
28	40	0534	256	30	0540
27	60	0535	255	28	0541
26	70	0536	254	28	0542
25	140	0537	253	26	0543
24	200	0538	252	28	0544
23	310	0539	251	22	0545
22	900	0540	250	24	0546
21	1250	0541	249	28	0547
20	2600	0542	248	30	0548
19	4200	0543	247	32	0549
18	7000	0544	246	42	0550
17	8000	0545	245	60	0551
16	10,000	0546	244	80	0552
			243	110	0553
(N. Stake Line)			242	185	0554
284	30	0512	241	295	0555
283	36	0513	240	470	0556
282	36	0514	239	1000	0557
281	40	0515	500 yds. GZ	10,000	0558
280	48	0516			
279	40	0517	NW Stake Line		
278	34	0518	106	600	0600
277	32	0519	107	300	0601
276	38	0520	108	180	0602
275	38	0521	109	90	0603
274	38	0522	110	60	0605
273	36	0523	111	40	0606
272	20	0524	112	30	0607
271	30	0525	113	20	0608
270	32	0526	114	22	0609
269	30	0526	115	12	0610
268	30	0527	116	14	0611
267	30	0528	117	16	0612
266	28	0530	118	12	0613
265	24	0531	119	12	0614

TABLE F.6 (Cont'd.)

INITIAL SURVEY - 25 May 1952 (Cont'd.)

Stake No.	Intensity Mr/Hr	Time	Stake No.	Intensity Mr/Hr	Time
120	12	0615	(S. Stake Line)		
121	12	0616	54	6	0545
122	10	0617	53	8	0546
123	8	0618	52	12	0547
124	10	0619	51	16	0548
125	10	0620	50	24	0550
126	16	0621	49	36	0551
127	10	0622	48	60	0552
128	12	0623	47	100	0553
129	8	0624	46	200	0554
130	14	0625	45	600	0555
131	8	0626	44	1400	0557
132	10	0627	43	4400	0558
133	10	0628	42	10,000	0600
134	14	0629			
135	14	0630	(SW Stake Line)		
136	10	0631	299	2.4	0530
137	10	0632	298	2.7	0531
138	10	0633	297	3.7	0531
139	8	0634	296	5	0532
140	8	0635	295	8	0532
141	10	0636	294	10	0533
142	8	0637	293	17.5	0533
143	8	0638	292	31	0534
144	8	0639	291	55	0534
145	8	0640	290	83	0535
146	14	0641	289	130	0535
147	14	0642	288	205	0536
148	10	0643	287	400	0537
149	8	0645	286	725	0537
			285	1000	0539
(SE Stake Line)					
(T-4 300 Station)	3	0515	(W. Stake Line)		
87	10	0516	158	1000	0632
86	21	0517	159	300	0633
85	31	0518	160	180	0633
84	80	0519	161	100	0634
83	100	0520	162	60	0634
82	180	0530	163	34	0635
81	181	0531	164	20	0636
80	280	0531	165	12	0637
79	420	0532	166	10	0638
78	1400	0533	167	4.6	0639
77	3000	0534	168	3.4	0640
76	10,000	0535	169	2.4	0641

TABLE F.6 (Cont'd.)

Stake No.	Intensity Mr/Hr	Time
170	2	0643
1000' E. 158	10,000	0630
(NE Stake Line)		
235	800	0530
233	900	0532
225	900	0458
210	160	0505
192	240	0515
188	800	0517
500 yds GZ	1000	0519
300 yds GZ	10,000	0520
(SW Stake Line)		
290	10	0510
285	100	0513
.2 mi NE 285	1000	0515
.4 mi NE 285	10,000	0517
(S. Stake Line)		
43	100	0530
41	1000	0534
.2 mi N 41	10,000	0537
(W. Stake Line)		
165	10	0602
158	100	0604
.1 mi E 158	1000	0606
.2 mi E 158	10,000	0608
(NW Stake Line)		
110	10	0600
106	100	0605
300 yds GZ	1000	0607
200 yds GZ	10,000	0610
200 yds GZ	10,000	0615
300 yds GZ	1000	0617
(N. Stake Line)		
239	100	0621
243	10	0628
(E. Stake Line)		
23	10	0500
19	100	0502
12	1000	0505
7	10,000	0510
(SE Stake Line)		
86	10	0525
77	1000	0528
73	10,000	0530
MORNING SURVEY - 27 May 1952		
(SW Stake Line)		
290	5	0450
289	7	0451
288	9	0452
287	14	0453
286	22	0454
285	46	0455
.1 mi NE 285	100	0456
.2 mi NE 285	265	0457
.3 mi NE 285	1000	0458
.4 mi NE 285	2600	0459
.5 mi NE 285	10,000	0500
(W. Stake Line)		
164	10	0505
163	14	0507
162	18	0508
161	25	0509
160	55	0510
159	150	0511
158	310	0512
.3 mi E 158	1200	0513
.2 mi E 158	2800	0514
.1 mi E 158	10,000	0515
(S. Stake Line)		
45	10	0525
44	24	0526
43	120	0527
42	320	0528
41	1400	0529
40	700	0530
600 yds GZ	1000	0532
400 yds GZ	2000	0534
250 yds GZ	4300	0536

TABLE F.6 (Cont'd.)

Stake No.	Intensity Mr/Hr	Time	Stake No.	Intensity Mr/Hr	Time
175 yds GZ	10,000	0533	201	80	0500
			200	75	0500
(SE Stake Line)			199	60	0501
84 (plus)	10	0601	198	60	0501
84	32	0600	197	80	0502
83	38	0559	196	100	0502
82	100	0558	195	100	0503
81	40	0557	194	80	0503
80	40	0556	193	100	0504
79	22	0555	192	140	0505
78	22	0554	191	180	0506
77	170	0553	190	200	0506
76	250	0552	189	240	0507
75	410	0551	188	270	0507
74	1600	0550	600 yds NE GZ	1000	0508
73	2400	0549	500 " "	1400	0508
600 yds GZ	3300	0548	400 yds "	10,000	0509
500 yds GZ	2200	0546			
400 yds GZ	3400	0544	(E. Stake Line)		
250 yds GZ	7800	0542	11	3300	0507
225 yds GZ	10,000	0540	15	1000	0509
			18	100	0512
(NE Stake Line)			21	10	0515
224	400	0448	Station 330	6000	0503
223	400	0448	Station 300	4000	0505
222	400	0449	400 yds E GZ	10,000	0500
221	400	0449			
220	400	0450	(N. Stake Line)		
219	400	0450	241	10	0507
218	100	0451	240	14	0508
217	100	0451	239	28	0509
216	100	0452	.1 mi S 239	120	0510
215	100	0453	.15 mi S of 239	200	0511
214	100	0453	.2 mi S 239	800	0512
213	100	0454	.21 mi S 239	(1r)	0512
212	100	0454	.3 mi S 239	(10r)	0514
211	100	0455			
210	100	0456	(NW Stake Line)		
209	100	0456	108	10	0518
208	100	0456	107	12	0519
207	100	0457	106	28	0520
206	100	0457	.1 mi SE 106	100	0521
205	100	0458	.15 mi SE 106	250	0522
204	100	0458	.2 mi SE 106	500	0523
203	80	0459	.23 mi SE 106	(1r)	0524
202	80	0500	.3 mi SE 106	(5r)	0525
			100 yds GZ	(10r)	0527

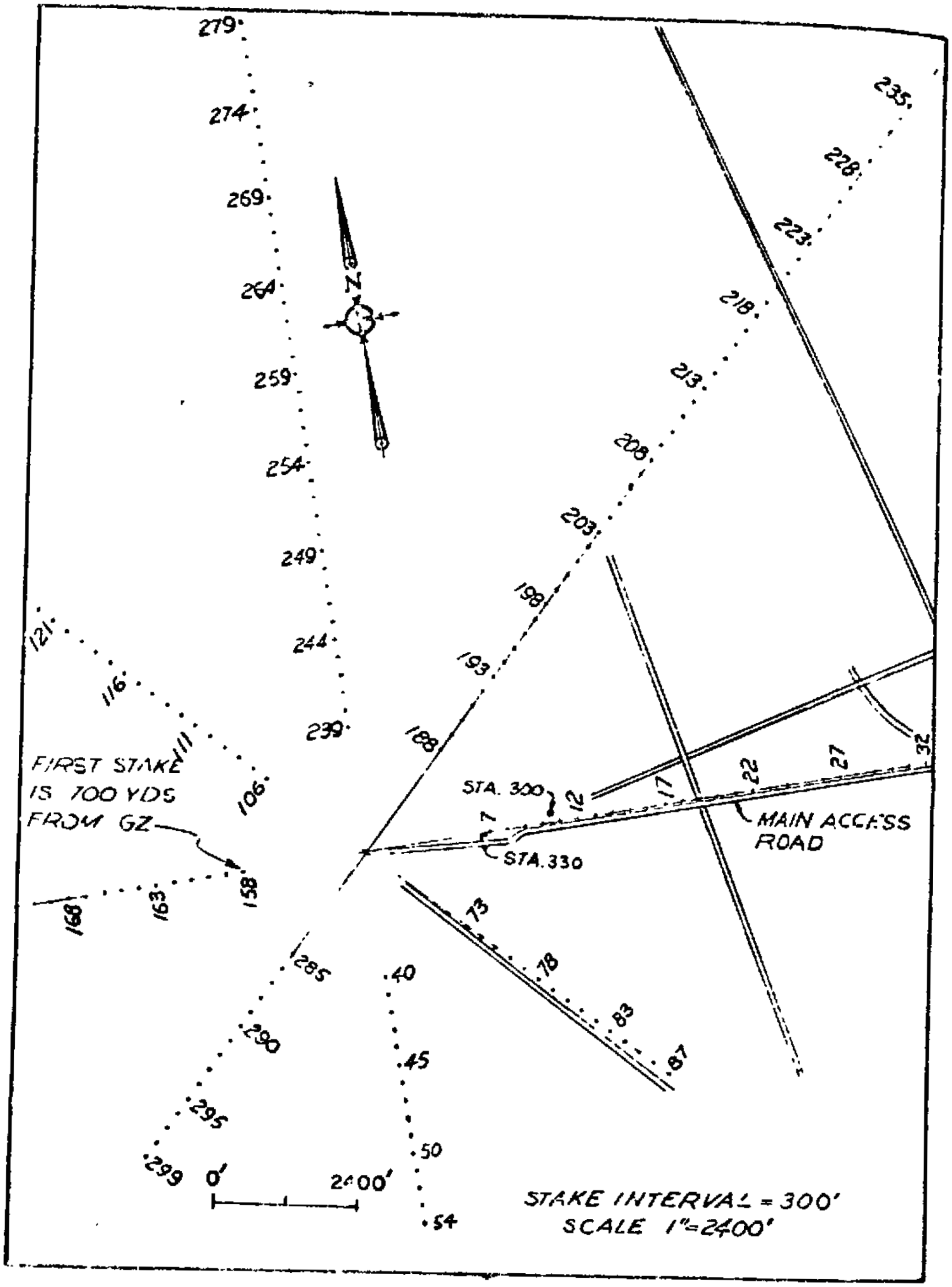


Fig. F.14 Plan - Area 4, Shot 6

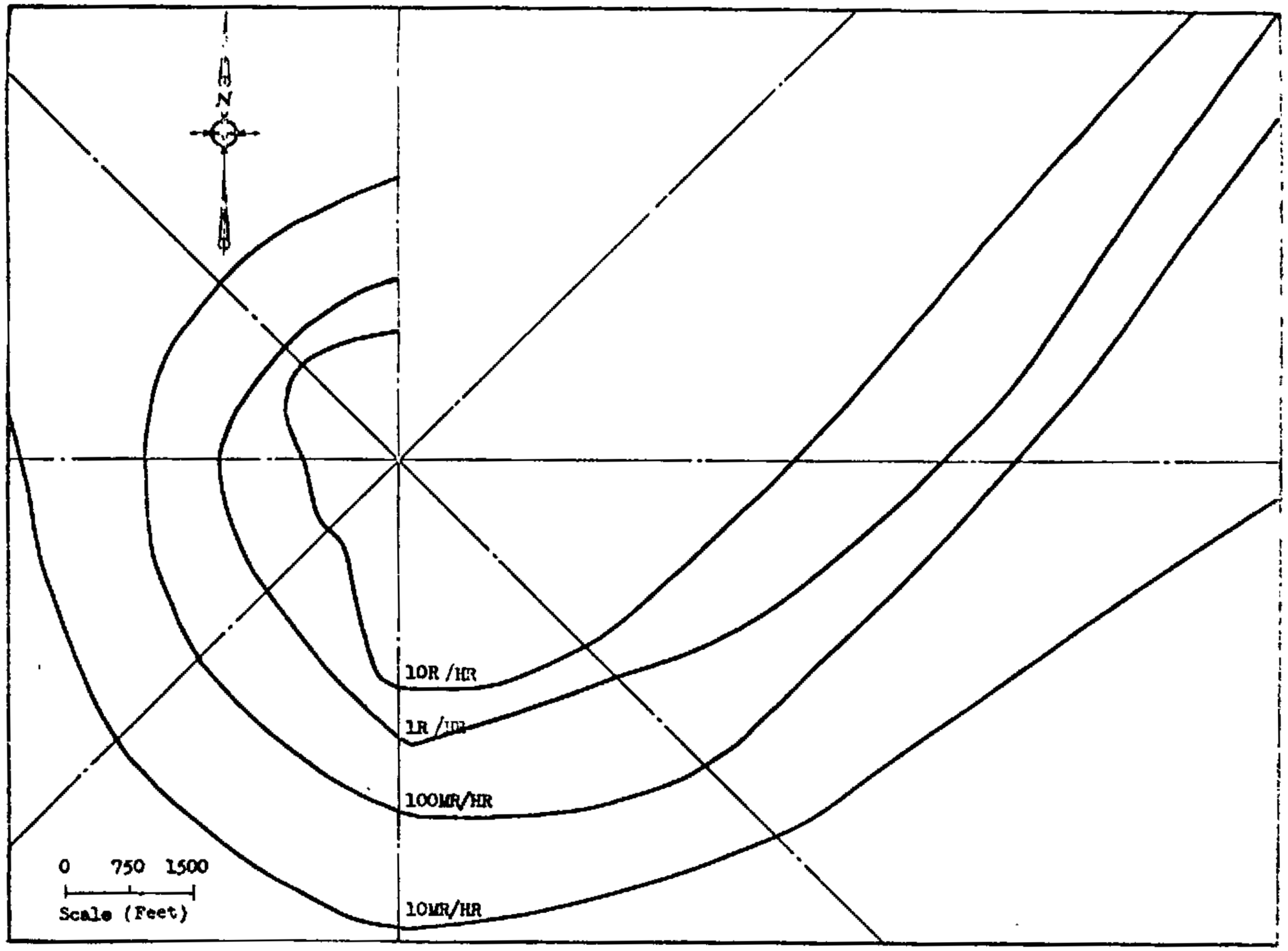


Fig. F.15 Isointensity Overlay, 0530, Shot 6 (H-Hour: 0359 PST) (See Figure F.14)

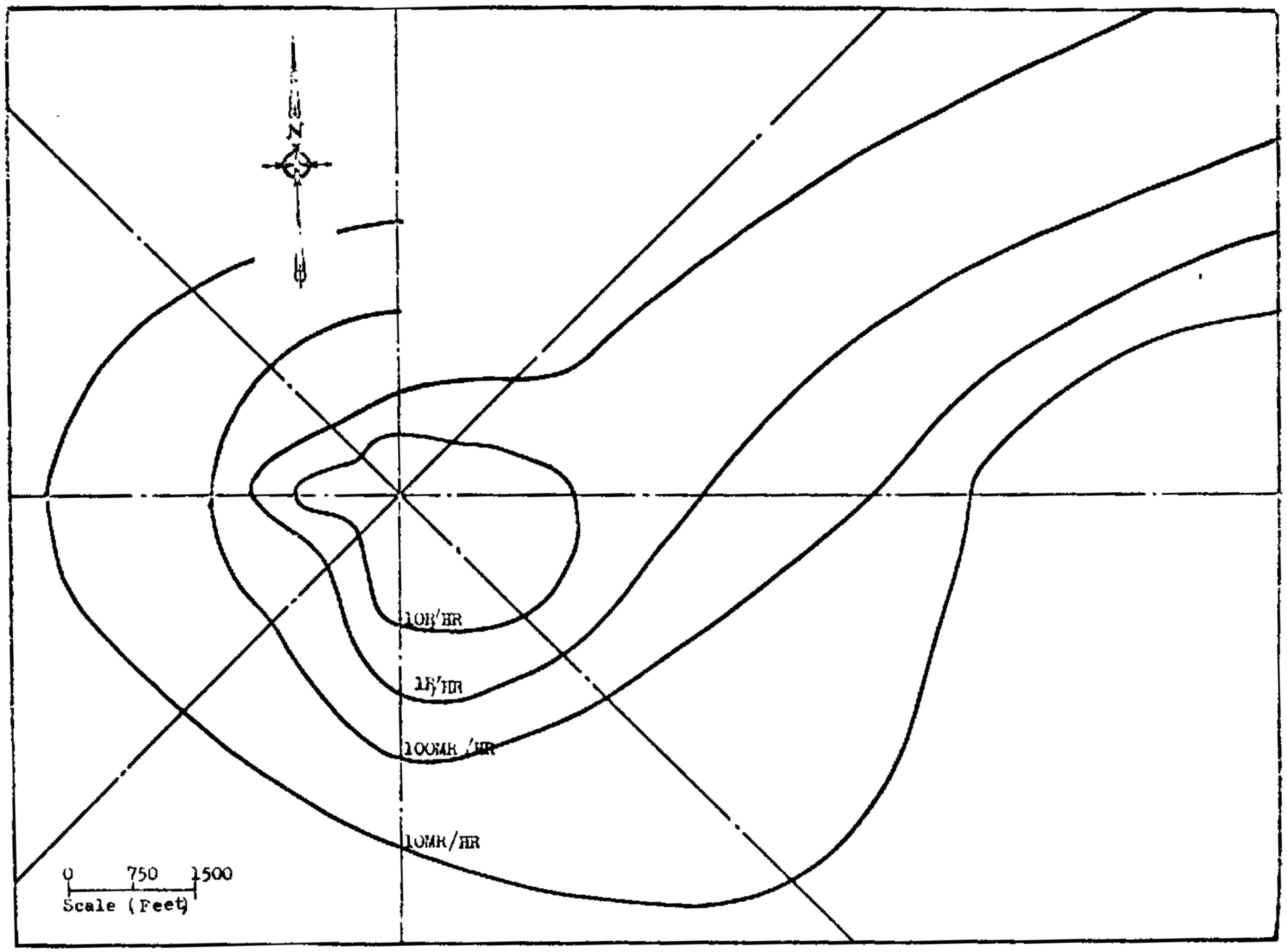


Fig. F.15.1 Isointensity Overlay, 0530, Shot 6 (See Fig. F.14). 26 May 1952

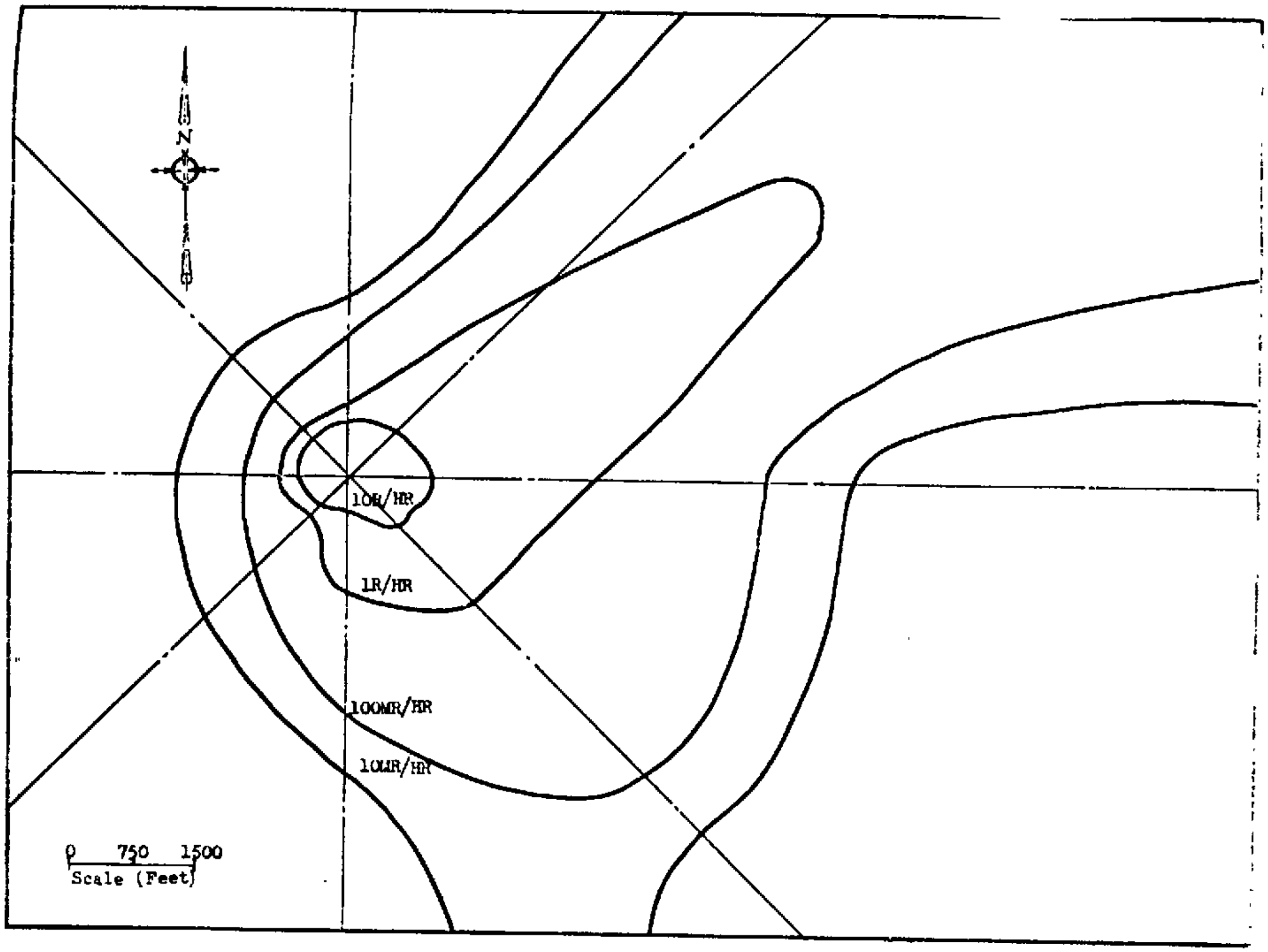


Fig. F.15.2 Isointensity Overlay, 0530, Shot 6, (See Fig. F.14). 28 May 1952

Cat 1

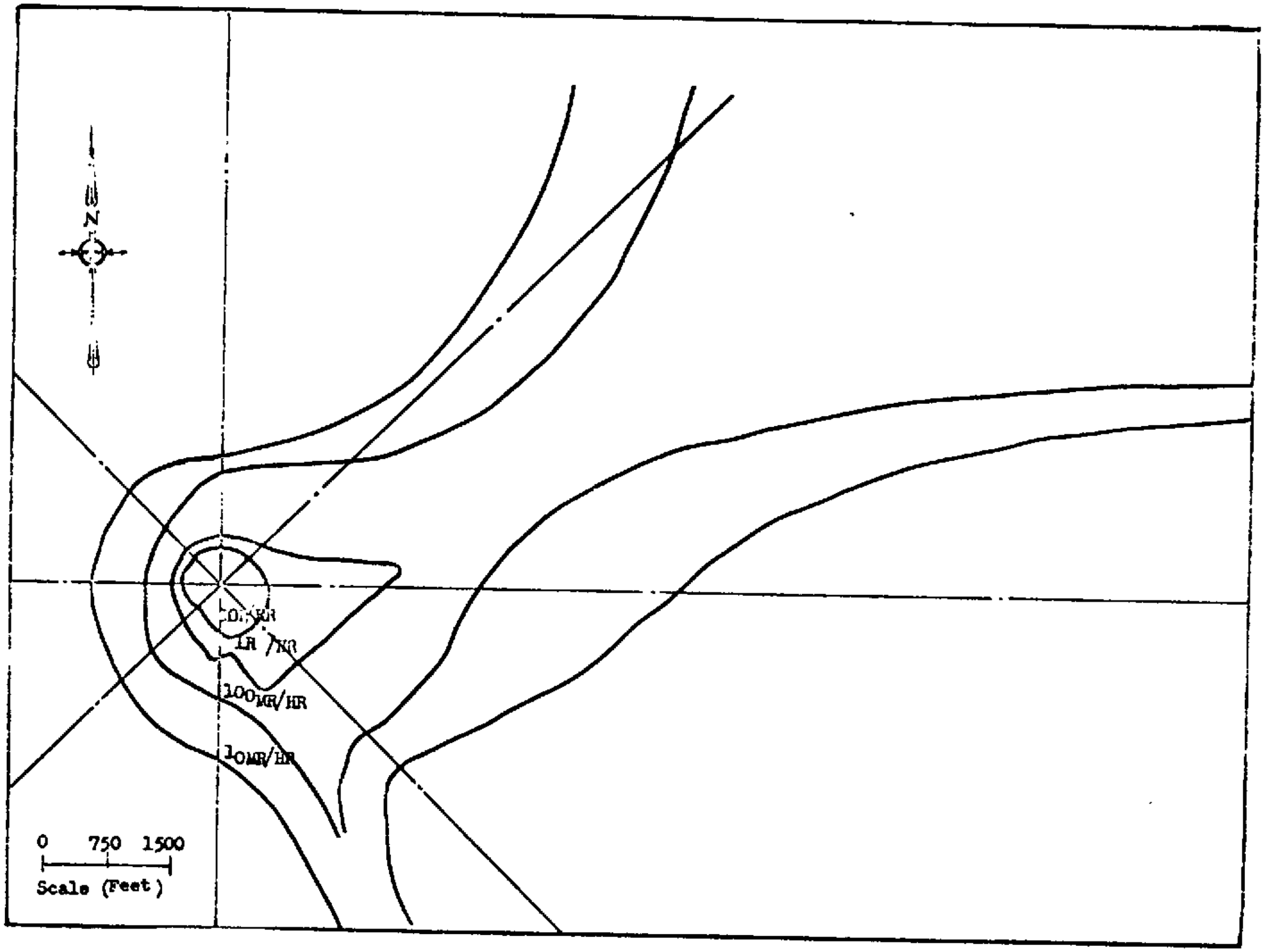


Fig. F.15.3 Isointensity Overlay, 0530, Shot 6 (See Fig. F.14), 20 May 1952

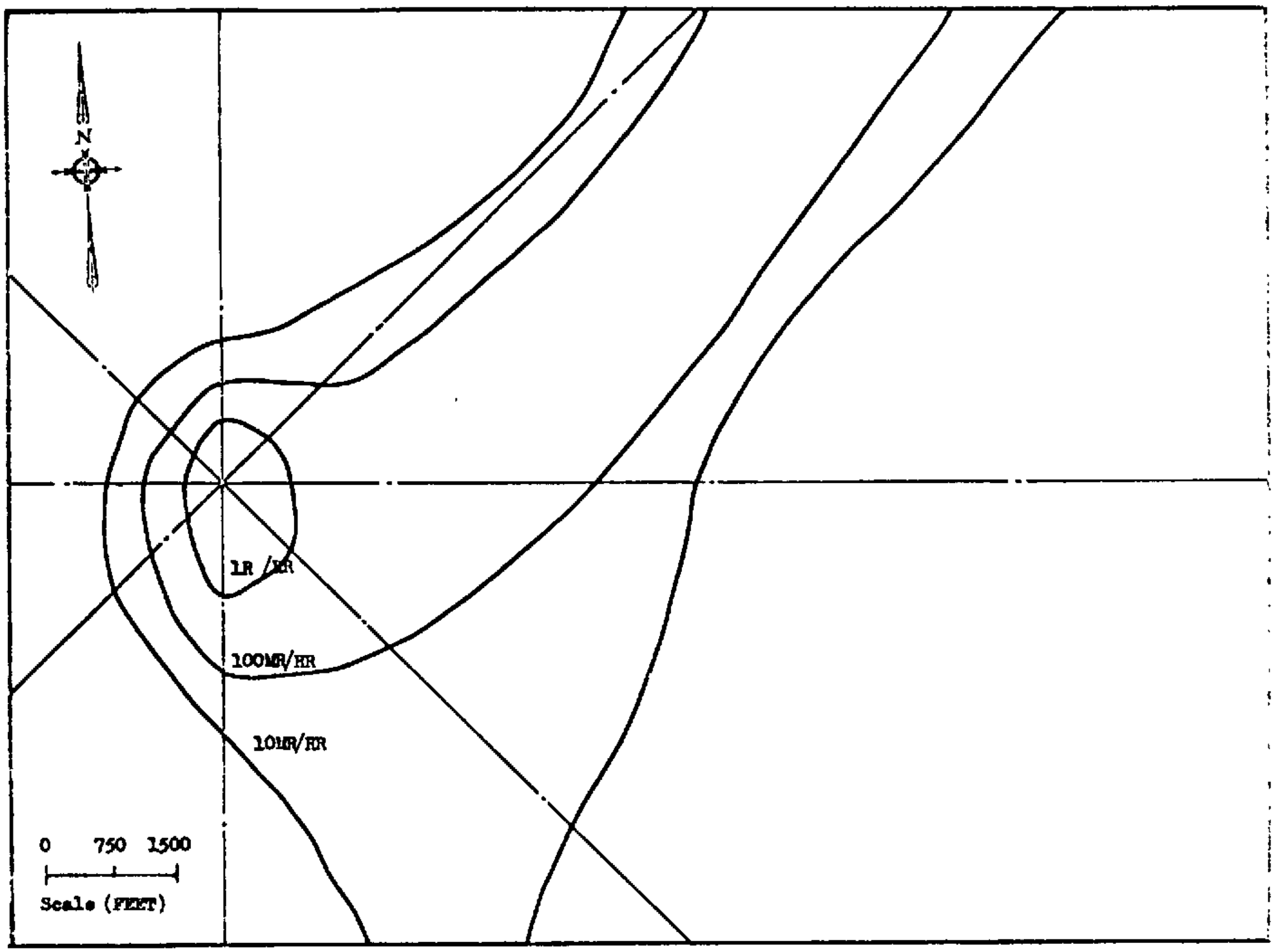


Fig. F.15.4 Isointensity Overlay, 0530, Shot 6, (See Fig. F.14)

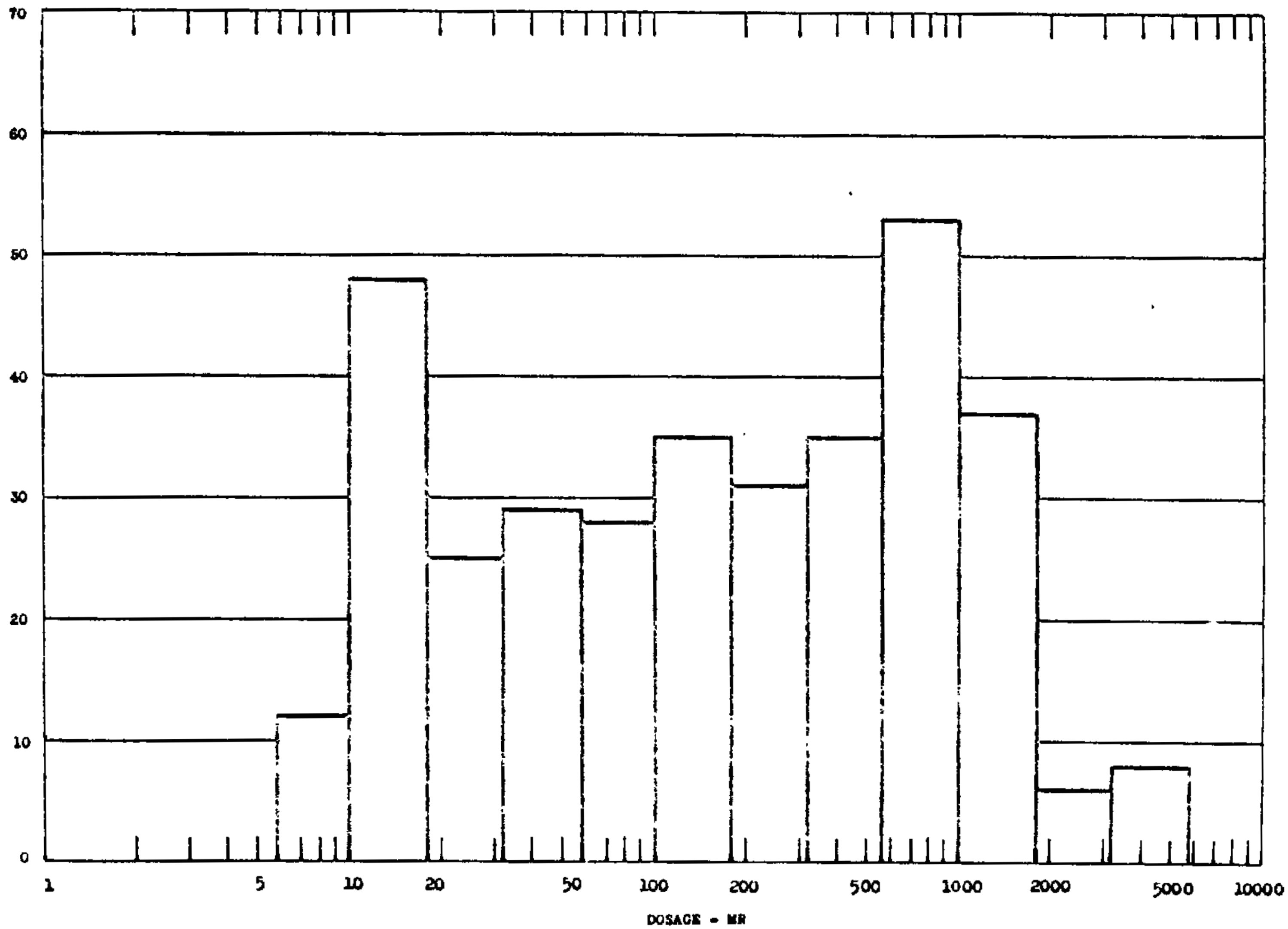


Fig. F.16 Accumulated Dose Report. (For Personnel Issued Film Badges During Period F to G-1 Days.)

APPENDIX G

OPERATION TUMBLER-SNAPPER
Shot 7 - 1 June 1952
(Period Covered: 1 June-4 June 1952)

OPERATIONAL DATA

Location: T-3 Area
Height of Burst: 300 ft.
Yield (KT): 13.8
Time Fired: 0355 (PST)

OPERATION TUMBLER-SNAPPER
Shot 7 - 1 June 1952

G.1 OFF-SITE OPERATIONS DEPARTMENT

weapon was detonated in the T-3 area on a 300-foot tower at 0355 (PST) on 1 June 1952. Although it was originally planned to detonate this shot in the T-2 Area of Yucca Flat, the contamination due to Shot 5 at T-1 and Shot 6 at T-4 was sufficiently high in this area to delay its preparation. Consequently, it was decided to detonate the seventh shot in the T-3 Area and use the T-2 Area for the last shot. The data obtained from this shot was similar to that from the previous two tower shots. On all the previous shots, both air and tower, the direction and time of fall-out predicted had agreed very closely with the actual fall-out pattern. However, during Shot 7 a small amount of fall-out occurred in the southeast quadrant that was not forecast. Since there were no winds measured in this direction, various hypotheses were proposed to explain the phenomenon. Later an additional check on the winds was made, and it was concluded that local air currents at low altitudes carried a small amount of radioactive material in this direction. The data collected by the Off-Site Operations Department are presented in Tables G.1 through G.5 and Figs. G.1 through G.7.

G.2 MATERIEL AND LOGISTICS DEPARTMENT

The time interval between the sixth and seventh shots was so short that little or no progress was made on inventory. During this test period 460 sets of protective clothing, 90 MX-5's and 160 T1B's were issued. No shortages or difficulties were encountered.

G.3 ON-SITE OPERATIONS DEPARTMENT

It was impossible to close the isointensity lines on G Day for the same reasons as on the previous two tower shots, but the field survey monitors were able to take sufficient readings on G+1 and G+2 Days to close the 10 r/hr and 1 r/hr lines. Later surveys showed a considerable amount of fall-out from this shot in the T-7 Area, approximately 3 miles west of the T-3 Area, and the old JANGLE Area, approximately 6 miles north of the T-3 Area. This contamination was carried by the surface winds from the T-3 Area and deposited on top of the contamination remaining from the JANGLE tests and that blown over from Shots 5 and 6. Because of this additional fall-out it was necessary to close the JANGLE area as well as Area 7, which had been declared "open" around 11 May.

Annex G of the Test Director's Operational Order #1-52 scheduled 19 programs and 38 projects for participation in technical test activities. Due to the high levels of contamination on vehicles and equipment returning from the test areas, the activities of the Vehicle

Decontamination Section were unusually extensive during the seventh shot period. In addition to normal activities, some of the equipment from other areas was returned to this section for decontamination prior to being shipped from the Nevada Proving Grounds. The accumulated doses of individuals working in the contaminated areas were generally slightly higher than for the previous two shots, as illustrated in Figure G.10, imposing heavier duties on the Personnel Decontamination Section. Many of the Rad-Safe monitors had reached the tolerance limit of exposure, so that rotation of personnel from other Rad-Safe departments was mandatory. In a few instances supervisory personnel were called upon to act as field monitors in addition to their other duties.

Data collected from this shot by the On-Site Operations Department are presented in Table G.6 and Figures G.8 through G.10.

TABLE G.1

Ground Mobile Monitors' Report - Shot 7 - 1 June 1952 (See Fig. E.1)
(Normal background: .02 - .04 mr/hr).

TIME (PST)	READING Mr/Hr	GRID LOCATION (Ref.Fig. E.1)	LOCATION IN DETAIL	REMARKS
0400	.2	E2 S4	Lincoln Mine	
0405	1 - 1.4	E2 S2	Groom Mine	
0423		E2 S2	Groom Mine	
0435		E2 S2	Groom Mine	
0430	.15	F2 S4	Caliente	
0440	300	E0 S4	4 mi. S of Sta. 38	
0455	1300	E0 S4	Sta. 38	
0505	400	E0 S4	5 mi W of Sta. 36	
0520	200	E0 S4	Sta. 36	
0535	26	E0 S4	Sta. 37	
0550	24	E2 S4	Sta. 30	
0600	20	E1 S4	Sta. 41	
0610	35	E1 S4	Halfway between Sta. 41 & 42	
0620	1.5		4 mi. NW of Sta. 2 (Y-intersection of Groom, Lincoln, Crystal Spgs. Rds.	
0620	300	E1 S4	Sta. 42	
0622	1.7	E2 S3	5 mi NW of Sta. 2	
0625	300	E1 S4	5 mi. NW of Sta. 42	
0630	160	E1 S4	8 mi. NW of Sta. 42	
0632	.2	E2 S3	10 mi NW of Sta. 2	
0640	40	E0 S4	Sta. 43	
0650	.25	E1 R3	24 mi. SW of Currant on US 6	
0650	10	E0 S4	4 mi. W of Sta. 43	
0654	.7	E1 R3	24 mi. SW of Currant	
0658	2	E1 R3	24 mi. SW of Currant	
0700	5	E1 R3	24 mi. SW of Currant	
0700	5	E0 S4	Sta. 44 (Reed)	
0710	.2	E2 S4	24 mi. NW of Sta. 2 (at Lincoln Mine)	
0710	40	E1 R3	24 mi. SW of Currant	
0710	90	E1 R3	22½ mi. SW of Currant (on US 6)	
0711	25	E1 R3	23 mi. SW of Currant (On US 6)	
0712	85	E1 R3	24 mi. SW of Currant (on US 6)	
0713	70	E1 R3	24½ mi. SW of Currant (on US 6)	
0714	50	E1 R3	25 mi. SW of Currant (on US 6)	
0715	30	E1 R3	25½ mi. SW of Curant (on US 6)	
0716	40	E1 R3	26 mi. SW of Currant (on US 6)	
0722	50	E1 R3	24 mi. SW of Currant	Maximum reading here
0722	.6	E1 R3	31 mi. NW of Sta. 2	
0724	10	E1 R3	28 mi. SW of Currant	
0725	.8	E2 S4	Sta. 30	
0726	5	E1 R3	28½ mi. SW of Currant	
0729	5	E0 R3	30 mi. SW of Currant	
0730	9	E0 R3	30½ mi. SW of Currant	

TABLE G.1 (Cont'd.)

TIME (PST)	READING Mr/Hr	GRID LOCATION (Ref.Fig. E.1)	LOCATION IN DETAIL	REMARKS
0731	12	E0 R3	31 mi. SW of Currant	
0732	13	E0 R3	$31\frac{1}{2}$ mi. SW of Currant	
0733	17	E0 R3	32 mi. SW of Currant	
0734	15	E0 R3	$32\frac{1}{2}$ mi. SW of Currant	
0735	8	E0 R3	33 mi. SW of Currant	
0735	10	E2 S4	5.1 mi. NW of Sta. 30	
0737	17	E0 R3	34 mi. SW of Currant	
0738	19	E0 R3	$34\frac{1}{2}$ mi. SW of Currant	
0739	12	E0 R3	35 mi. SW of Currant	
0740	16	E0 R3	$35\frac{1}{2}$ mi. SW of Currant	
0741	15	E0 R3	36 mi. SW of Currant	
0742	28	E0 R3	$36\frac{1}{2}$ mi. SW of Currant	
0743	20	E1 S4	6 mi. NW of Sta. 30	
0743	21	E0 R3	37 mi. SW of Currant	
0744	18	E0 R3	$37\frac{1}{2}$ mi. SW of Currant	
0745	24	E1 S4	6.2 mi. NW of Sta. 30	
0745	12	E0 R3	38 mi. SW of Currant	
0746	11	E0 R3	$38\frac{1}{2}$ mi. SW of Currant	
0747	10	E0 R3	39 mi. SW of Currant	
0748	8	E0 R3	$39\frac{1}{2}$ mi. SW of Currant	
0748	27	E1 S4	6.5 mi. NW of Sta. 30	
0750	25	E1 S4	6.7 mi. NW of Sta. 30	
0750	45	E1 R3	24 mi. SW of Currant	
0750	9	E0 R3	$40\frac{1}{2}$ mi. SW of Currant	
0753	7	D5 R3	42 mi. SW of Currant	
0755	10	D5 R3	43 mi. SW of Currant	
0756	8	D5 R3	$43\frac{1}{2}$ mi. SW of Currant	
0757	6	D5 R3	44 mi. SW of Currant	
0758	7	D5 R3	$44\frac{1}{2}$ mi. SW of Currant	
0800	4	D5 R3	$46\frac{1}{2}$ mi. SW of Currant	
0800	30	E1 S4	7 mi. NW of Sta. 30	
0802	34	E1 S4	7.3 mi. NW of Sta. 30	
0802	5	D5 R3	$48\frac{1}{2}$ mi. SW of Currant	
0803	9	D5 R3	$49\frac{1}{2}$ mi. SW of Currant	
0805	10	D5 R3	$51\frac{1}{2}$ mi. SW of Currant	
0805	41	E1 S4	7.5 mi. NW of Sta. 30	
0806	50	E1 S4	7.7 mi. NW of Sta. 30	
0806	8	D5 R3	52 mi. SW of Currant	
0807	9	D5 R3	53 mi. SW of Currant	
0808	8	D5 R3	54 mi. SW of Currant	
0810	9	D5 R2	56 mi. SW of Currant	
0811	10	D5 R2	57 mi. SW of Currant	
0812	8	D5 R2	58 mi. SW of Currant	

TABLE G.1 (Cont'd.)

TIME (PST)	READING Mr/Hr	GRID LOCATION (Ref.Fig. E.1)	LOCATION IN DETAIL	REMARKS
0813	7	D4 R2	59 mi. SW of Currant	
0813	80	E0 S4	8.1 mi. NW of Sta. 30	
0814	100	E0 S4	8.2 mi. NW of Sta. 30	
0814	9	D4 R2	60 mi. SW of Currant	
0815	7	D4 R2	61 mi. SW of Currant	
0816	6	D4 R2	62 mi. SW of Currant	
0819	4	D4 R2	65 mi. SW of Currant	
0820	3	D4 R2	66 mi. SW of Currant	
0822	3	D4 R2	Warm Spgs. (to Tonopah & Return)	
0822	200	E0 S4	9 mi. NW of Sta. 30	
0833	230	E0 S4	11.5 mi. NW of Sta. 30	
0835	30	E1 R3	24 mi. SW of Currant	
0855	30	E1 R3	24 mi. SW of Currant	
0945	2	E3 S2	4.3 mi. W of "Y" (toward Groom)	
0946	4	E3 S2	5 mi. W of "Y" (toward Groom)	
0947	6	E3 S2	6.7 mi. W of "Y" (Toward Groom)	
0950	8	E3 S2	9 mi. W of "Y" (toward Groom)	
0952	6	E3 S2	10.6 mi. W of "Y" (toward Groom)	
0953	4	E3 S2	11.3 mi. W of "Y" (Toward Groom)	
0957	6	E3 S2	14 mi. W of "Y" (toward Groom)	
1000	.02 -.05	H2 Q2	Delta, Utah	
1004	4	E3 S2	18 mi. W of "Y"	
1007	2	E3 S2	19 mi. W of "Y"	
1010	4	E2 S2	21.2 mi. W of "Y"	
1011	8	E2 S2	21.7 mi. W of "Y"	
1012	10	E2 S2	23 mi. W of "Y"	
1013	8	E2 S2	23.3 mi. W of "Y"	
1014	6	E2 S2	24.8 mi. W of "Y"	
1015	4	E2 S2	25 mi. W of "Y"	
1015	5	E2 Q3	50 mi. NW of Ely on US 50	
1018	1	E2 S2	Groom Mine	
1020	16	E2 Q3	50.5 mi. W of Ely on US 50	
1023	15	E2 Q3	51 mi. W of Ely on US 50	
1025	16	E2 Q3	51.5 mi. W of Ely on US 50	
1027	22	E2 Q3	52 mi. W of Ely on US 50	
1030	20	E1 R3	24 mi.SW of Currant	
1032	13	E2 Q3	52.5 mi. W of Ely on US 50	
1043	22	E1 Q3	53 mi. W of Ely on US 50	
1046	28	E1 Q3	54 mi. W of Ely on US 50	
1050	26	E1 Q3	55 mi. W of Ely on US 50	
1053	26	E1 Q3	56 mi. W of Ely on US 50	
1100	5	E1 Q3	57 mi. W of Ely on US 50	
1100	17	E1 R3	24 mi. SW of Curant	
1110	3	E1 Q3	58 mi. W of Ely on US 6	

TABLE G.1 (Cont'd.)

TIME (PST)	READING Mr/Hr	GRID LOCATION (Ref.Fig. E.1)	LOCATION IN DETAIL	REMARKS
1117	8	E1 Q3	59 mi. W of Ely on US 6	
1125	5	E1 Q3	60 mi. W of Ely on US 6	
1130	5	D4 R2	6 mi. NE of Warm Spgs. on US 6	
1131	6	D4 R2	7 mi. NE of Warm Spgs. on US 6	
1133	7	D4 R2	9 mi. NE of Warm Spgs. on US 6	
1135	5	D4 R2	11 mi. NE of Warm Spgs. on US 6	
1147	3	D5 R3	22 mi. NE of Warm Spgs. on US 6	
1150	1.4 -7	E1 Q3	Eureka, Nev.	
1155	4	E0 R4	28 mi. NE of Warm Spgs.	
1200	.05	F5 P4	Wendover, Utah	
1215	5	E0 R3	35 mi. NE of Warm Spgs.	
1216	4	E0 R3	37 mi. NE of Warm Spgs.	
1218	6	E0 R3	39 mi. NE of Warm Spgs.	
1220	3	E0 R3	40½ mi. NE of Warm Spgs.	
1222	14	E0 R3	43½ mi. NE of Warm Spgs.	
1223	16	E0 R3	44½ mi. NE of Warm Spgs.	
1225	20	E0 R3	46 mi. NE of Warm Spgs.	
1227	15	E1 R3	47½ mi. NE of Warm Spgs.	
1228	11	E1 R3	48 mi. NE of Warm Spgs.	
1232	5	E1 R4	51 mi. NE of Warm Spgs.	
1235	6	E1 R4	54½ mi. NE of Warm Spgs.	
1236	4	E1 R4	55 mi. NE of Warm Spgs.	
1237	7	E2 R4	55½ mi. NE of Warm Spgs.	
1238	5	E2 R4	56½ mi. NE of Warm Spgs.	
1240	4	E2 R4	59 mi. NE of Warm spgs.	
1242	3	E2 R4	62 mi. NE of Warm Spgs.	
1243	2	E2 R4	63 mi. NE of Warm Spgs.	
1250	4	E0 Q3	9 mi. E of Eureka on US 50	
1255	.8	E1 P5	Elko, Nevada	
1300	.9	E1 P5	Elko, Nevada	
1300	10.3	E1 R3	24 mi. SW of Currant	
1300	1	E1 Q3	14 mi. E of Eureka, Nev.	
1330	6	E1 Q3	50 mi. E of Eureka, Nev.	
1330	1.5	E1 P5	Elko, Nev.	
1330	2	E1 P5	Elko, Nev.	
1410	2.5	E1 P5	Elko, Nev.	
1335	2	E1 P5	Elko, Nev.	
1400	11.5	E1 R3	24 mi. SW of Currant	
1500	9.2	E1 R3	24 mi. SW of Currant	
1600	8.8	E1 R3	24 mi. SW of Currant	
1700	8	E1 R3	24 mi. SW of Currant	

TABLE G.2

Aerial Terrain Survey Report (Badger I & II and Woodchuck II) - Shot 7 - 1 June 1952 (See Fig. A.2). (Background Compensated for all readings .1 mr.) (Code: Badger - C-47 aircraft. Woodchuck - L-20.)

Report Number	Grid Position (Ref. Fig. A.2)	Time of Report (PST)	Absolute Altitude (ft)	B-21 Meter Reading (Millivolts B.G./B.G.Cont.)	Rate Meter Reading (Counts/Min)	Geiger-Mueller Reading (Mr/Hr)
(1 June 1952)						
BADGER I						
1	1B4	0653	500	200/200	2,500	0
2	1B3	0657	800	200/200	2,600	0
3	1B2	0701	500	200/830	3,000	.1
4	1B1	0704	800	200/500	2,600	0
5	1B0	0707	500	200/11,500	100,000	70
6	4B1	0711	400	200/2900	18,000	
7	4B2	0715	300	200/290	18,000	0
8	4B3	0718	1000	200/200	17,000	0
9	4B4	0722	800	200/200	9,000	0
10	4C4	0724	1000	200/200	8,000	0
11	4C3	0727	1000	200/200	8,000	0
12	4C2	0731	300	200/250	8,000	0
13	4C1	0736	1500	200/1000	11,000	.4
14	4C.5	0737	500	200/4900	64,000	18
15	4C0	0739	1500	200/5000	54,000	0
16	1C.5	0741	1000	200/2000	40,000	0
17	1C1	0743	1500	200/200	24,000	0
18	1C2	0746	1500	200/300	24,000	0
19	1C3	0750	1500	200/300	24,000	0
20	1C4	0754	2000	200/700	24,000	0
21	1D4	0758	500	200/270	22,000	0
22	1D3	0802	700	200/400	22,000	0
23	1D2	0806	1000	200/300	22,000	0
24	1D1	0810	1000	200/4600	60,000	.5
25	1D0	0813	500	200/5000	64,000	4

TABLE G.2 (Cont'd.)

Report Number	Grid Position (Ref.Fig. A.2)	Time of Report (PST)	Absolute Altitude (ft)	B-21 Meter Reading (Millivolts B.G./B.G.Cont.)	Rate Meter Reading (Counts/Min)	Geiger-Mueller Reading (Mr/Hr)
26	4D1	0816	700	200/4100	50,000	5
27	4D2	0820	500	200/1500	30,000	0
28	4D3	0824	1000	200/200	28,000	0
29	4D4	0827	500	200/200	2,400	0
30	4E5	0833	500	200/200	2,400	0
31	4E4	0837	1000	200/200	2,200	0
32	4E3	0841	1000	200/350	2,200	0
33	4E2	0844	500	200/600	2,400	0
34	4E1	0848	800	200/1500	10,000	1.5
35	4E8	0850	700	200/2400	14,000	1.7
36	4E0	0852	1500	200/1700	10,000	6
37	1E1	0855	500	200/4400	20,000	4
38	1E2	0900	1000	200/200	7,600	0
39	1E3	0904	800	200/400	8,000	0
40	1E4	0909	1000	200/300	7,000	0
41	1F4	0912	800	200/200	7,000	0
42	1G4	0915	800	200/200	7,000	0
43	1G3	0919	1500	200/200	7,000	0
44	1G2	0923	500	200/500	7,000	.1
45	1G0	0929	1000	200/1000	7,000	.1
46	4G1	0933	700	200/1700	9,000	1
47	4G2	0936	400	200/2500	12,000	0
48	4G3	0939	500	200/1000	50,000	.1
49	1G4	0942	500	200/400	60,000	0
50	1G5	0946	1000	200/300	55,000	0
51	4H6	0951	1500	200/200	2,500	0
52	4I7	0956	800	250/250	3,000	0
53	4I6	1001	500	250/500	5,000	0
54	4I5	1005	1000	250/800	5,000	.2
55	4I4	1009	500	250/1000	100,000	.2

TABLE G.2 (Cont'd.)

Report Number	Grid Position (Ref.Fig. A.2)	Time of Report (PST)	Absolute Altitude (ft)	B-21 Meter Reading (Millivolts B.G./B.G.Cont.)	Rate Meter Reading (Counts/Min)	Geiger-Mueller Reading (Mr/Hr)
56	4I3	1011	1000	250/1300	Inoperative	.2
57	4I2	1015	1500	250/600	Inoperative	0
58	4I1	1018	1000	250/800	7,000	.1
59	4I0	1022	700	250/800	7,000	.1
60	1I1	1026	1000	250/1100	7,000	.1
61	1I2	1031	1500	250/600	7,000	0
62	1I3.4	1038	1000	200/200	7,000	0
BADGER II						
1	1E0	0755	10,000	170/610	900	.1 X-Ray
2	1D0	0915	10,000	1000/1000	1,000	.2 X-Ray
WOODCHUCK II						
1	103	0553	300			.03
2	403	0611	500			..02
3	4½A3	0615	200			.04
4	1½A3	0637	100			.04
5	1A3	0640	50			.03
6	4A3	0702	20			.04
7	4A4	0705	20			.03
8	4½A½4	0708	20			.03
9	1A½4	0730	20			.01
(2 June 1952)						
BADGER I						
1	2F5	0743	900	200/200	2,400	0
2	2G3	0750	900	200/200	2,400	0
3	3G1	0804	200	100/200	2,400	0
4	3G4	0816	1100	200/200	2,000	0
5	3C5	0831	100	200/200	2,400	0
6	308	0849	300	180/180	2,400	0

TABLE G.2 (Cont'd.)

Report Number	Grid Position (Ref. Fig. A.2)	Time of Report (PST)	Absolute Altitude (ft)	B-21 Meter Reading (Millivolts B.G./B.G.Cont.)	Rate Meter Reading (Counts/Min)	Geiger-Mueller Reading (Mr/Hr)
7	4B6	0900	100	180/180	2,400	0
8	4G7	0924	500	180/180	2,400	0
9	4G4	0935	300	180/180	2,400	0
10	4G2½	0940	100	180/180	2,600	.05
11	4G1	0943	100	180/1000	3,000	.14
12	1G1	0950	400	180/1000	2,400	.16
13	1F½1½	0955	200	180/400	2,600	Max. .36
14	1C½6½	1019	900	180/300	2,500	.02
15	1C9	1028	200	200/200	2,400	0
16	1A9	1040	600	170/170	2,400	0
17	2B8	1049	1200	170/170	2,300	0
BADGER II						
1	2E5	0740	1000	230/235	900	0
2	2E3	0747	500	275/285	1,000	0
3	2E1	0755	1000	280/290	950	0
4	2E0	0758	1000	280/290	950	0
5	3D2	0808	1000	280/255	800	0
6	3C4	0811	1000	240/260	800	0
7	3O5	0821	1000	255/270	950	0
8	4B5	0831	500	270/285	1,000	0
9	4D4	0847	1000	265/275	1,000	0
10	4D3	0850	1000	260/270	950	0
11	4D2	0855	500	270/330	1,000	0
12	4D1	0900	500	300/950	1,000	.2
13	4D0	0902	1000	380/600	950	0
14	1D1	0904	1000	370/950	1,050	.5
15	1D2	0907	1000	360/950	1,100	0
16	1C3	0911	1000	280/460	950	0
17	1B5	0922	1000	260/510	900	0

TABLE G.2 (Cont'd.)

Report Number	Grid Position (Ref. Fig. A.2)	Time of Report (PST)	Absolute Altitude (ft.)	B-21 Meter Reading (Millivolts B.G./B.G.Cont.)	Rate Meter Reading (Counts/Min)	Geiger-Mueller Reading (Mr/Hr)
18	1C5	0929	1000	240/270	800	0
19	2B4	0939	500	240/260	950	0
20	2C4	0946	1000	235/255	800	0
21	2C3	0950	1000	230/245	800	0

TABLE G.3

Aerial Cloud Trackers' Report (Hounddog I, II and IV) - Shot 7 - 1 June 1952 (See Fig. A.2)
(Code: Hounddog - B-29 aircraft).

Report Number	Grid Position (Ref. Fig. A.2)	Time of Report (PST)	Mean Sea Level Altitude (Ft)	B-21 Meter Reading (Millivolts B.G./B.G.Cont)	Rate Meter Reading (Counts/Min)	Geiger-Mueller Reading (Mr/Hr)
(1 June 1952)						
HOUNDDOG I						
1	1Y9	1031	18,000			2
2	1Y4	1036	20,000			12
3	1X3	1052	22,000			3
4	1Z7	1107	22,000			3
5	1Y8	1115	22,000			2
6	1A9	1124	22,000			3
7	1AL7	1131	22,000			3
8	1AL5	1136	22,000			20
9	1AC11	1142	22,000			10
10	1Z11	1150	22,000			5
11	1X8	1203	22,000			20
HOUNDDOG II						
1	4D4	0440	18,000			-
2	4A1	0455	18,000			1

TABLE G.3 (Cont'd.)

Report Number	(Ref. Fig. A.2)	Time of Report (PST)	Mean Sea Level Altitude (Ft.)	B-21 Meter Reading (Millivolts B.G./B.G.Cont)	Rate Meter Reading (Counts/Min)	Geiger-Mueller Reading (Mr/Hr)
3	1D3	0506	18,000			.2
4	1E5	0509	18,000			9
5	1E3	0515	18,000			9
6	1F2	0518	18,000			10
7	1F1	0522	18,000			20
8	1D2	0531	18,000			70
9	1C3	0550	22,000			1700
10	1I4	0605	22,000			2
11	1J3	0609				10
12	4I1	0617				2.5
13	1G6	0648	18,000			.04
14	1M6	0702	18,000			.5
15	106	0708	18,000			1
16	103	0712	18,000			2
17	101	0717	18,000			6
18	401	0721	18,000			4
19	4L1	0738	10,000			10
20	1F0	0755	18,000			-
21	1R6	0827	22,000			6
22	1S7	0828	22,000			30
23	1U3	0840	22,000			20
24	1T1	0850	22,000			16
25	4S2	0857	22,000			7
26	1N4	0912	22,000			2
27	1M1	0920	22,000			Neg.
28	1W8	0944	22,000			80
29	1Z5	0956	22,000			7
30	1X1	1007	22,000			8
31	4W1	1022	22,000			2
32	4R2	1013	22,000			Neg.

TABLE G.3 (Cont'd.)

Report Number	Grid Position (Ref. Fig. A.2)	Time of Report (PST)	Mean Sea Level Altitude (ft)	B-21 Meter Reading (Millivolts B.G./B.G.Cont.)	Rate Meter Reading (Counts/Min)	Geiger-Mueller Reading (Mr/Hr)
HOUNDDOG IV						
1	2A1	0425	9,000			48
2	1A0	0435	9,000			1-2
3	4C0	0447	9,000			1
4	4C1	0450	9,000			6
5	4C1	0454	9,000			8
6	4B2	0456	9,000			2
7		0505	13,500			2
8	4C1	0512	14,000			2
9	4C1	0514	14,000			2
10	4D0	0516	14,000			2
11	4C1	0518	14,000			2
12	1D1	0523	14,000			8
13	1E1	0524	14,000			10
14	1D2	0526	14,000			5
15	1B1	0534	14,000			4
16	1B1	0537	14,000			3
17	1C4	0546	14,000			3
18	1D4	0550	14,000			3
19	1I6	0600	14,000			3
20	1I3	0605	13,000			20
21	1I11	0612	13,000			4
22	1G3	0621	13,000			5
23	4D1	0629	13,000			4
24	4B1	0636	10,000			3

TABLE G.4

Fixed Air Sampling and Fall-out Tray Report - Shot 7 - 1 June 1952 *

CODE	STATION	AIR CONCENTRATION $\mu c/m^3$ (Hi-Vol) 1 Hr.	24 Hrs.	F. O. TIME AFTER H-HOUR	FALL-OUT TRAYS $d/m/ft^2$	Part/Tray	μc/Part	PARTICLE SIZE MMD	% < 5μ	BACKGROUND RECORDER Arrival Time	High Reading Mr/Hr
CP	CP	7.72^{-3}	569×10^{-6}	2.5	384×10^{3}	-	-	2.2	70	2.25	.5
M	MERCURY	-	186×10^{-6}	-	224×10^{3}	-	-	-	-	-	Bkgd.
IS	Indian Spgs.	-	171×10^{-6}	-	284×10^{3}	-	-	-	-	1	.11
LV	Las Vegas	-	45×10^{-6}	-	42.9×10^{3}	-	-	-	-	-	Bkgd.
NE	Nellis AFB	-	50.5×10^{-6}	-	64.5×10^{3}	-	-	-	-	-	-
GJ	Glendale	580×10^{-6}	345×10^{-6}	-	201×10^{3}	-	-	-	-	2.7	.8
AL	Alamo	3.44×10^{-3}	210×10^{-6}	-	342×10^{3}	-	-	-	-	-	Bkgd.
CS	Crystal Spgs	90.3×10^{-3}	4.32×10^{-3}	.5	132×10^{3}	-	-	-	-	-	-
CA	Caliente	15.1×10^{-3}	1.12×10^{-3}	-	294×10^{3}	-	-	-	-	-	Bkgd.
PI	Pioche	49.7×10^{-3}	4.58×10^{-3}	-	35.8×10^{6}	-	-	4.7	51	-	Bkgd.
EL	Ely	16.4×10^{-6}	5.41×10^{-6}	-	1.46×10^{6}	-	-	-	-	-	Bkgd.
WS	Warm Spgs	-	18.8×10^{-3}	-	447×10^{3}	-	-	-	-	4.38	5.8
CU	Currant	-	314×10^{-6}	-	185×10^{3}	-	-	-	-	2.85	2.4
BE	Beatty	-	218×10^{-6}	-	212×10^{3}	-	-	-	-	-	Bkgd.
GM	Groom Mine	10.8×10^{-3}	665×10^{-6}	-	-	-	-	-	-	-	Bkgd.
LM	Lincoln Mine	1.49×10^{-3}	82×10^{-6}	-	-	-	-	-	-	-	Bkgd.
SS	Sunnyside	8.55×10^{-3}	622×10^{-6}	-	64.1×10^{3}	-	-	-	-	-	Bkgd.
WC	20 Mi. W of Currant	152×10^{-3}	12.7×10^{-3}	3	3.50×10^{9}	-	-	3.2	62	2.83	14

*See Explanatory Notes (Page 79)

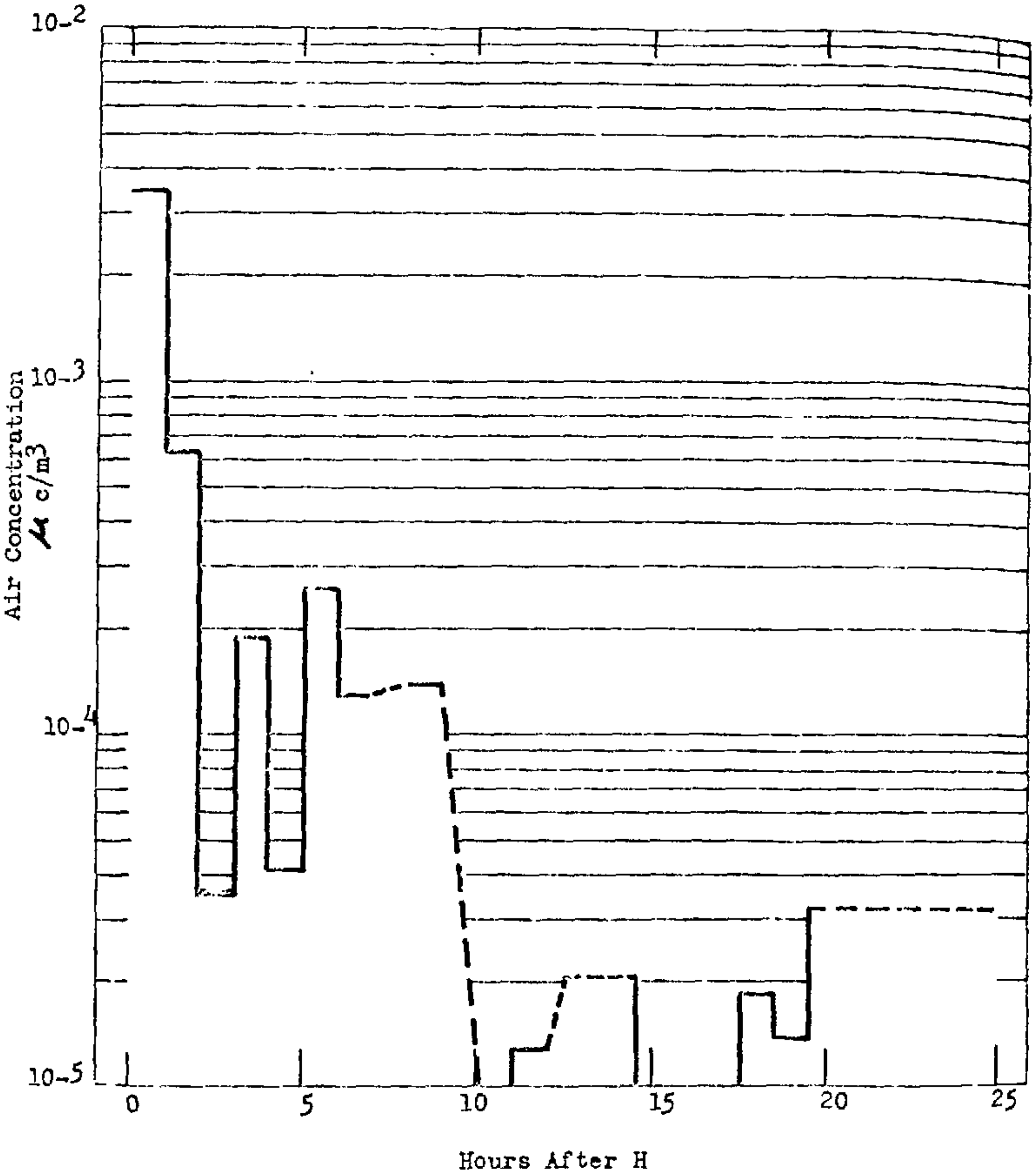


Fig. G.1 Air Radioactive Concentration vs Time - Alamo (See Table G.4)

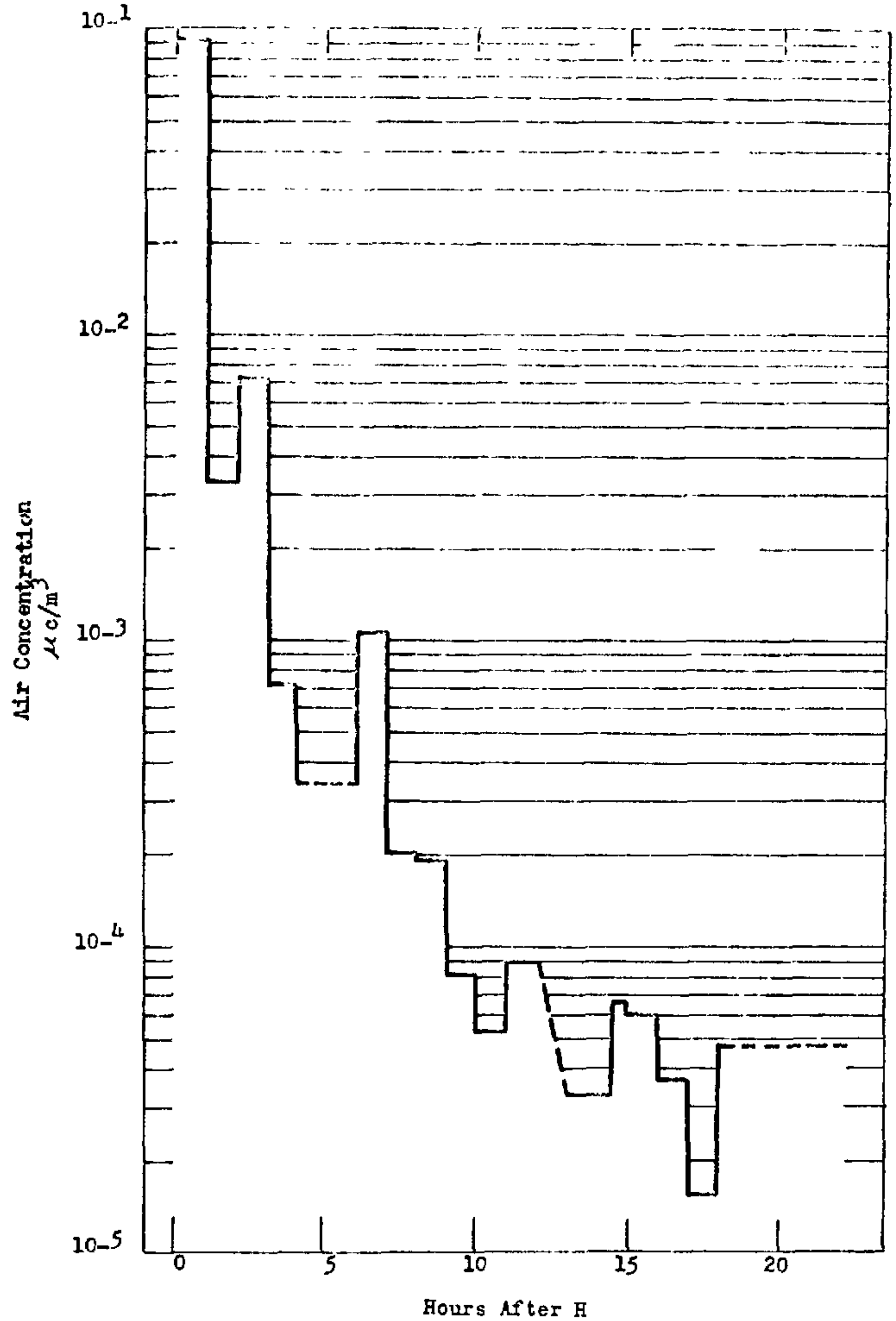


Fig. G.2 Air Radioactive Concentration vs Time - (Crystal Spring) (See Table G.4)

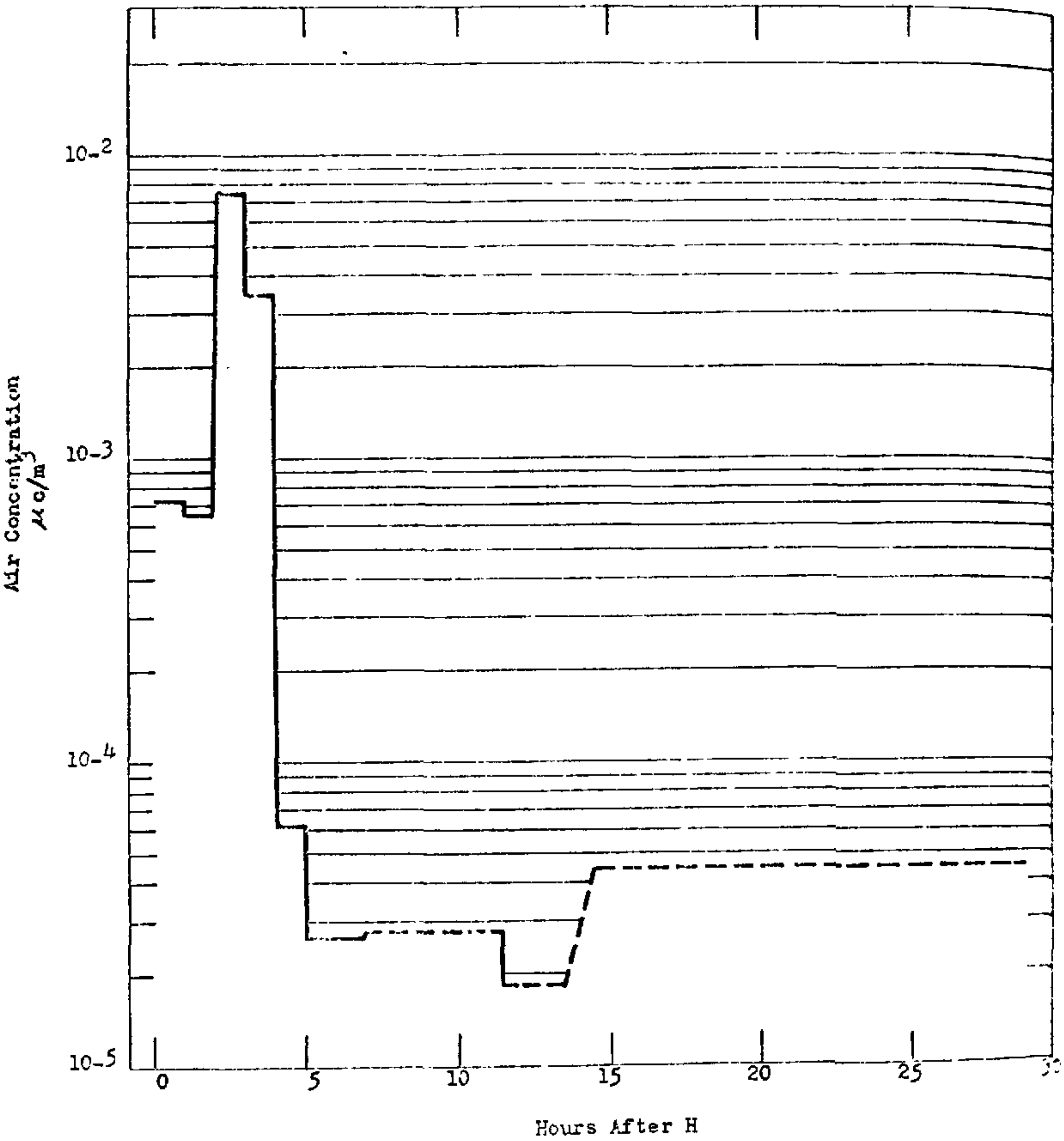


Fig. G.3 Air Radioactive Concentration vs Time (CP) (See Table G.4)

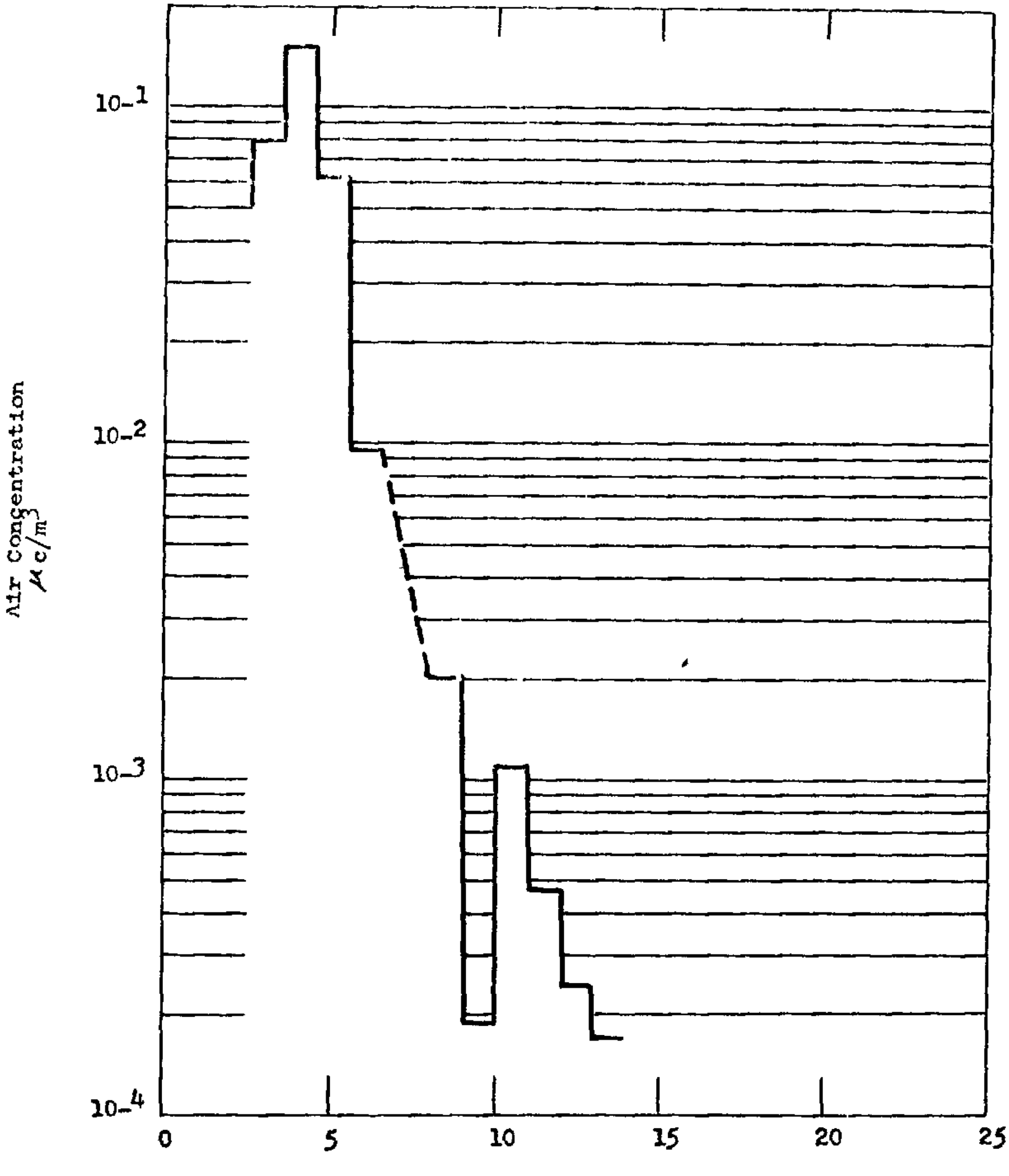


Fig. G.4 Air Radioactive Concentration vs Time (20 mi. West of Current) (See Table G.4)

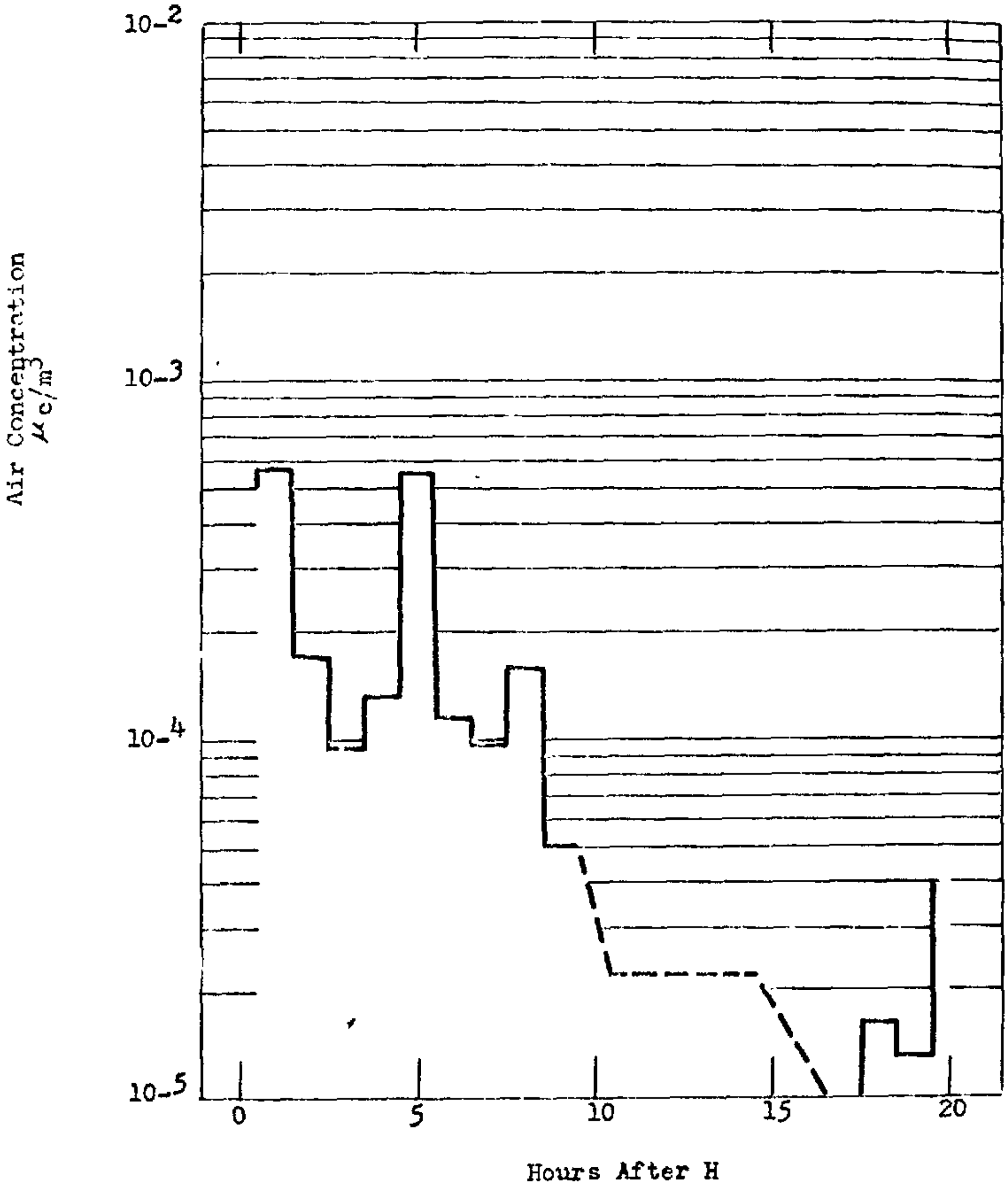


Fig. G.5 Air Radioactive Concentration vs Time (Glendale Junction)
(See Table G.4)

TABLE G.5

Weather Data - Shot 7 - 1 June 1952

Wind Information at CP

Time (PST)	Altitude in Ft. m.s.l.	Direction in Degrees	Speed in Knots
0245	Surface	000	0
	5,000	000	0
	6,000	170	17
	7,000	170	18
	8,000	170	17
	9,000	160	17
	10,000	160	15
	12,000	180	17
	14,000	180	26
	15,000	170	26
	16,000	170	29
	18,000	190	30
	20,000	190	44
	22,000	190	48
	24,000	200	41
	25,000	200	42
	26,000	200	43
	28,000	190	38
0500	Surface	000	0
	4,000	000	0
	5,000	000	0
	6,000	180	11
	7,000	190	15
	8,000	190	18
	9,000	190	18
	10,000	180	17
	12,000	170	18
	14,000	180	24
	15,000	180	25
	16,000	180	27
	18,000	200	32
	20,000	200	37
	22,000	200	44
	24,000	190	42
	25,000	190	41
	26,000	190	41
	28,000	190	35
	30,000	190	43
	35,000	200	26
	40,000	210	4
	45,000	200	13

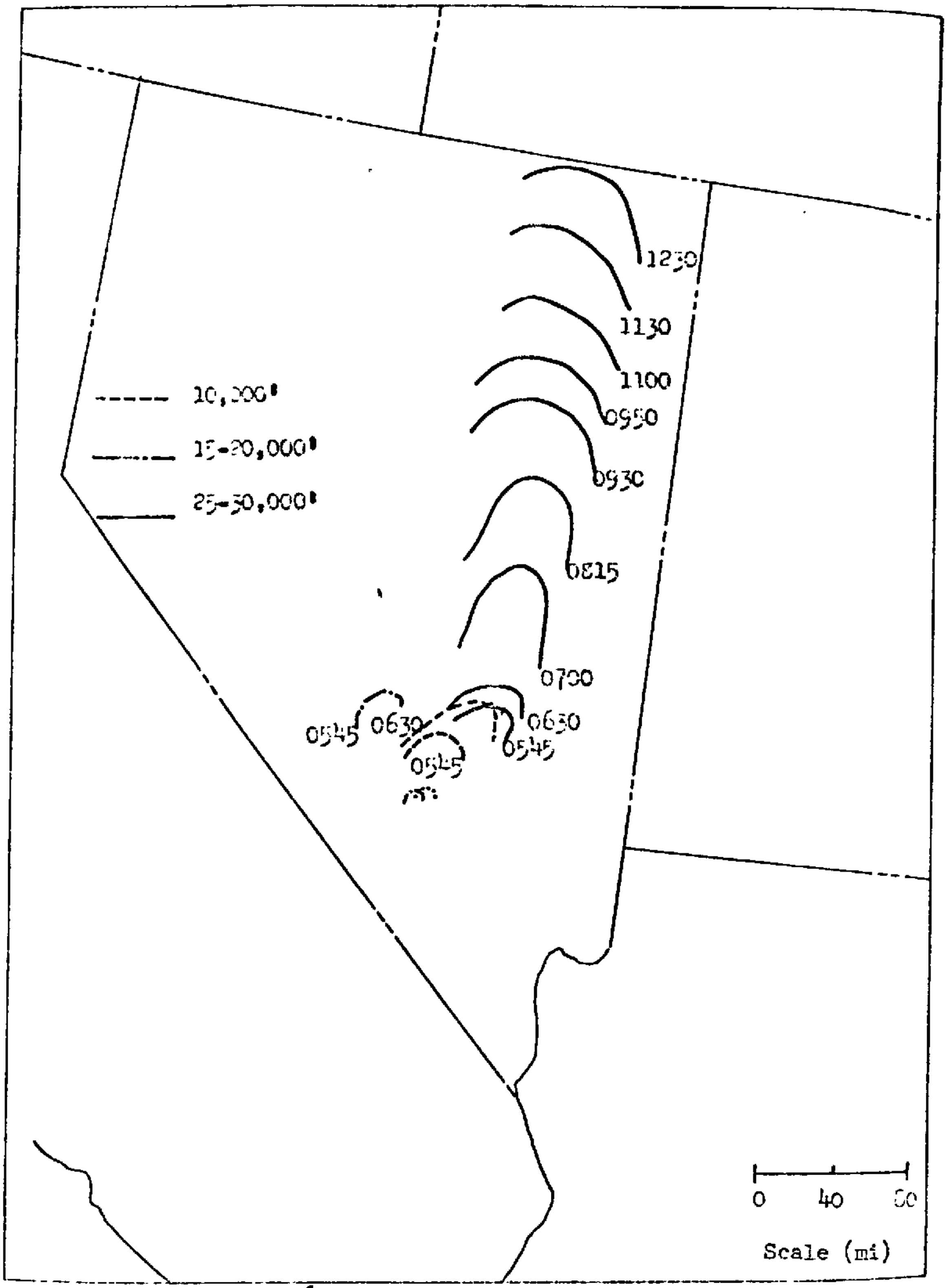


Fig. G.6 Cloud Progression, Shot 7

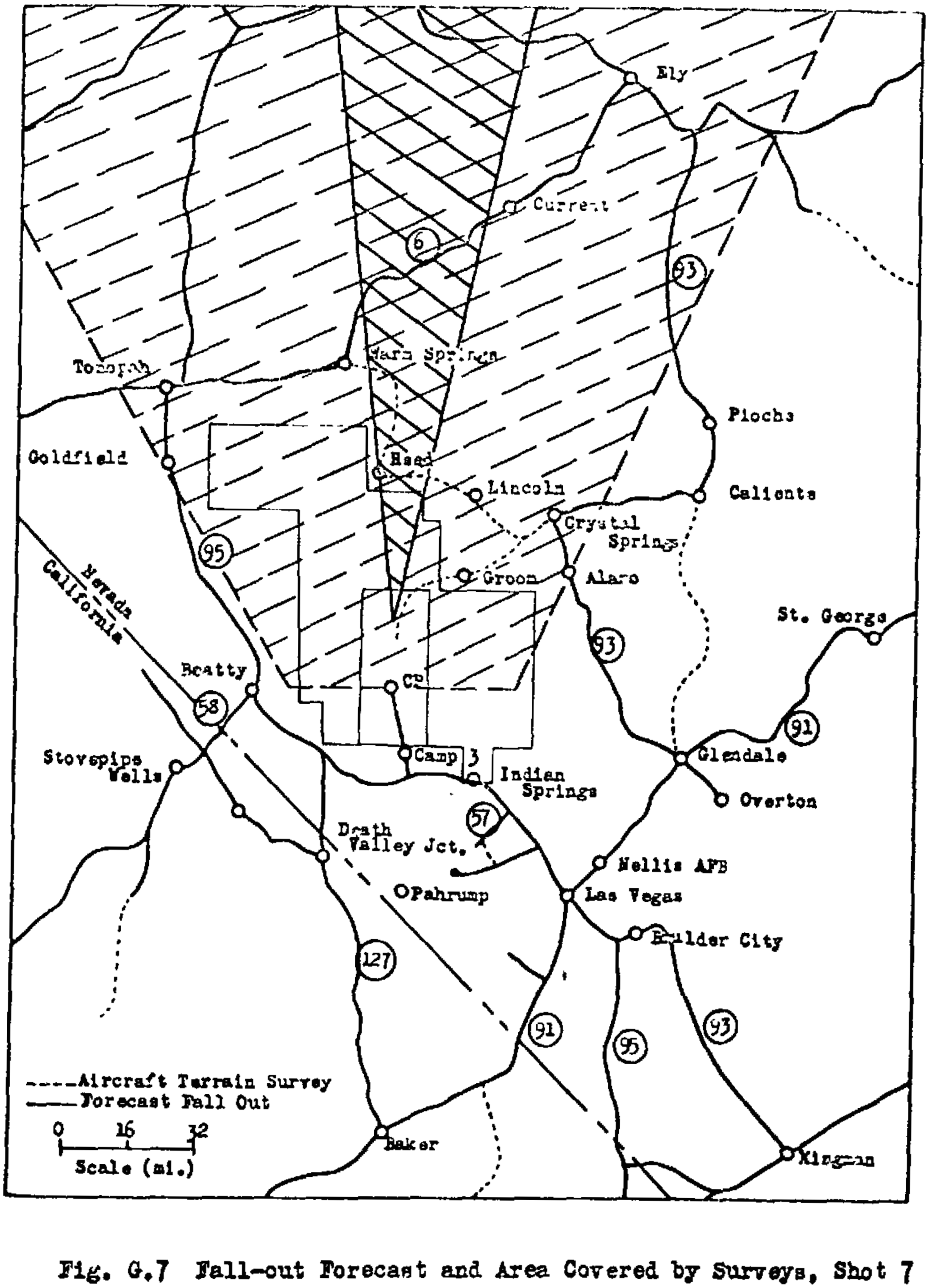


Fig. G.7 Fall-out Forecast and Area Covered by Surveys, Shot 7

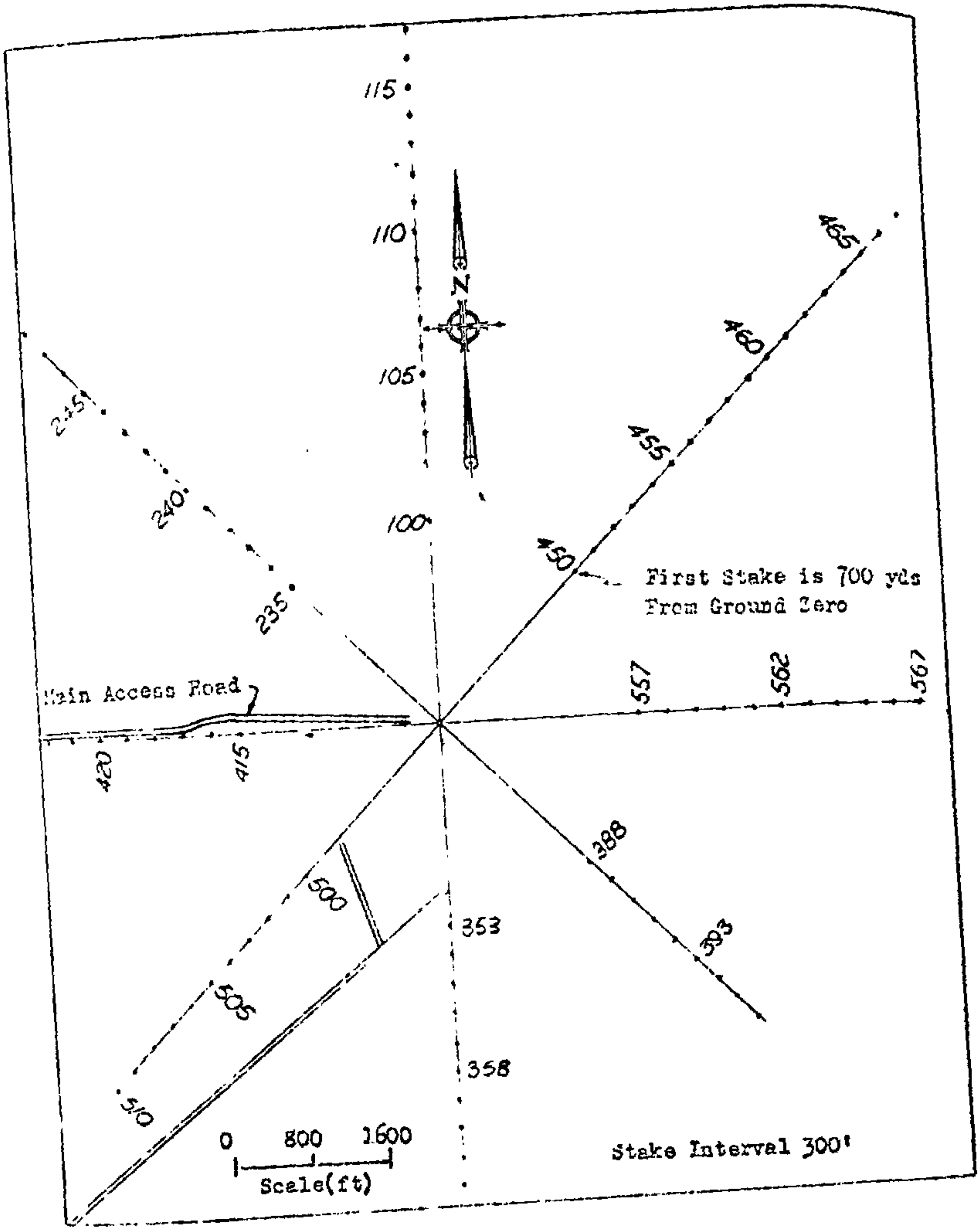


Fig. G.8 Plan - Area 3 - Shot 7

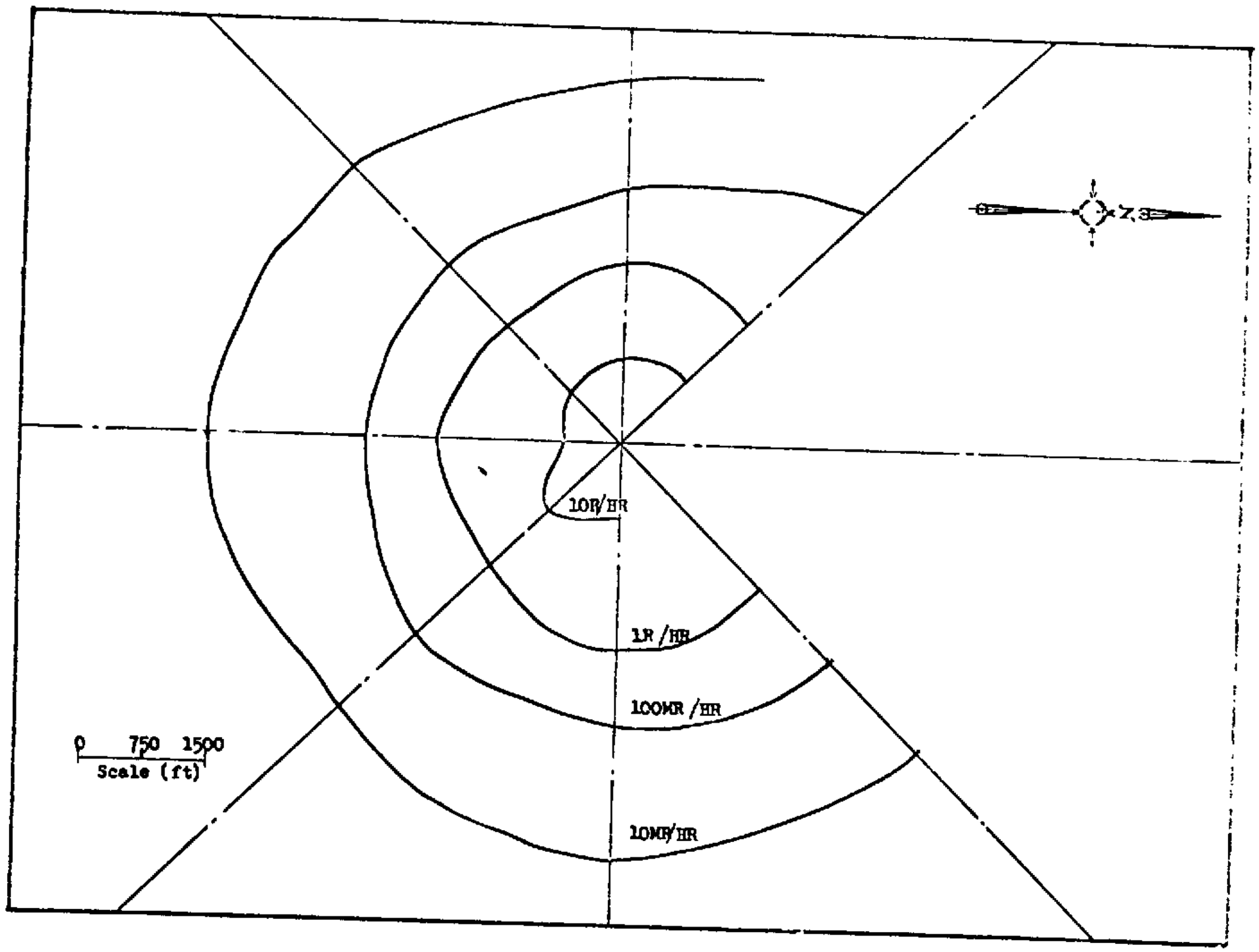


Fig. G.9 Isointensity Overlay, 0530, Shot 7 (H-Hour, 0355 PST) (See Fig. G.8)

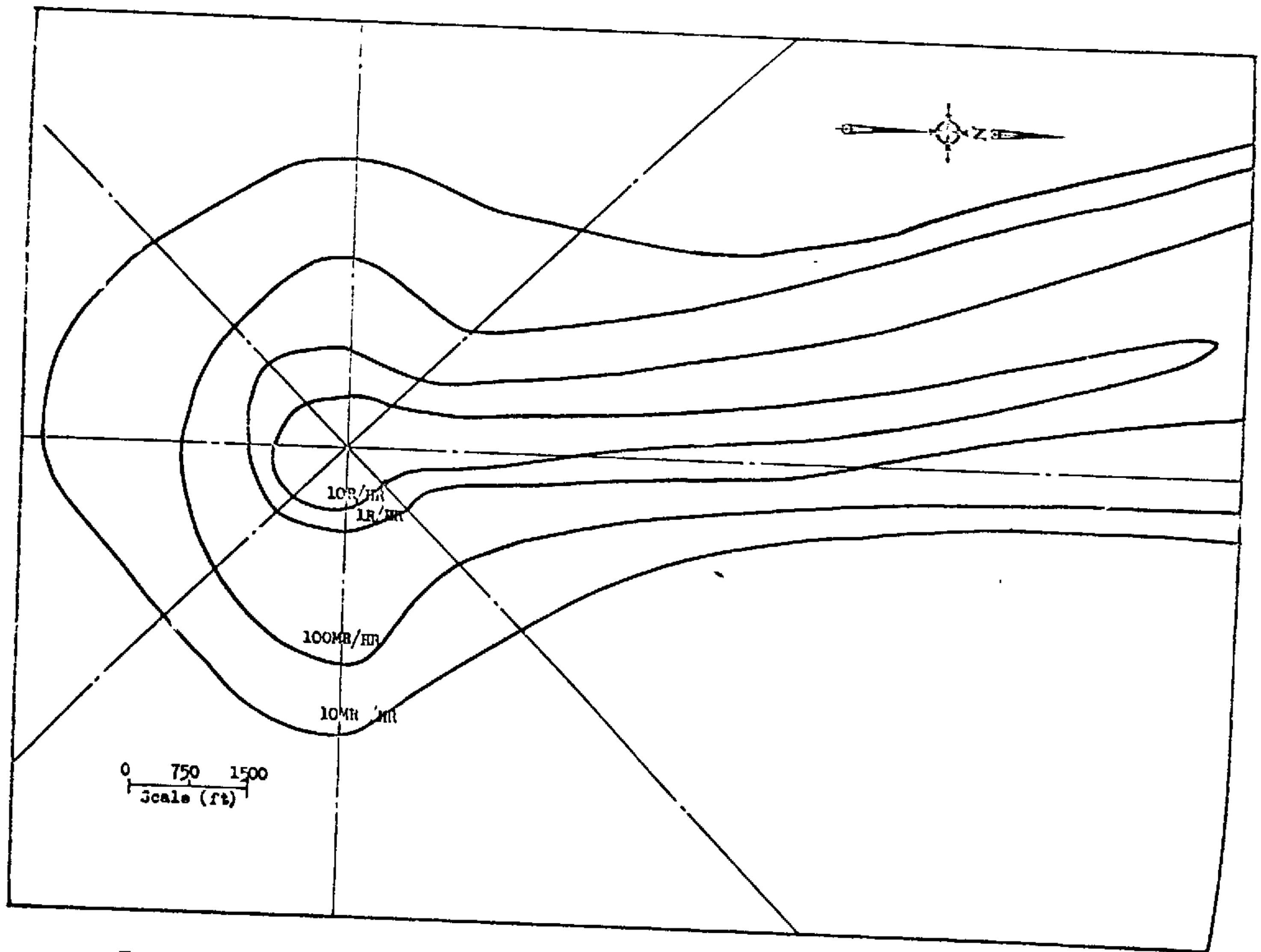


Fig. G.9.1 Isointensity Overlay, 0530, Shot 7 (See Fig. G.8)

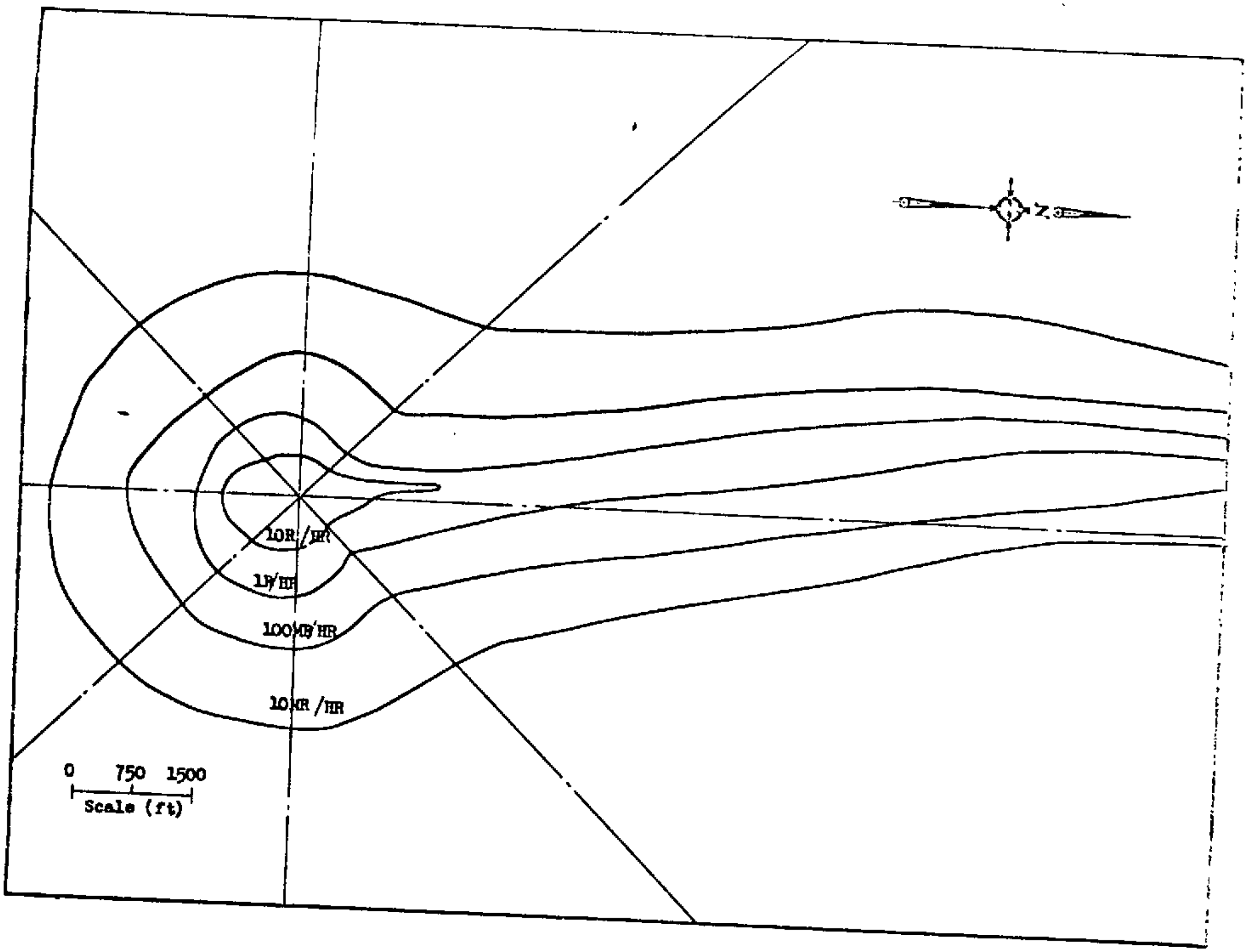


Fig. G.9.2 Isointensity Overlay, 0530, Shot 7 (See Fig. G.8)

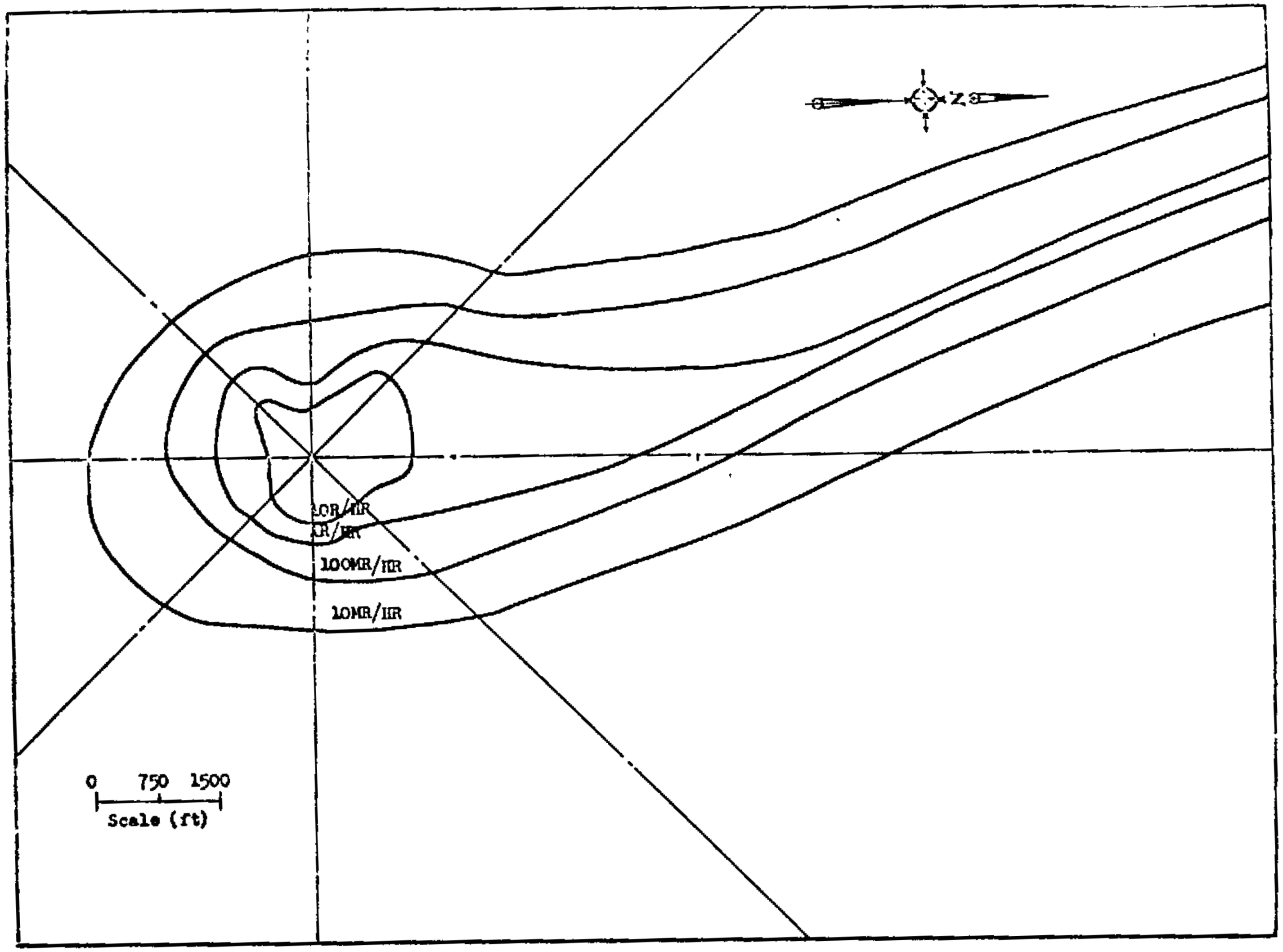


Fig. G.9.3 Isointensity Overlay, 0530, Shot 7 (See Fig. G.8)

TABLE G.6

Monitors' Survey Report - Shot 7 - 1 June 1952

(Initial Survey - 1 June 52)

Stake No.	Intensity Mr/Hr	Time
(SW Stake Line)		
508	10	0532
503	100	0533
(NE Stake Line)		
50 yds to GZ from 500	(1R)	0535
.45 mi. NE 500	(10R)	0537
(W Stake Line)		
.25 mi. E 416	(10r)	0548
50 yds E 416	(1r)	0547
417	100	0544
418	100	0544
419	95	0543
420	30	0542
421	28	0541
422	11	0540
423	7	0539
(SW Stake Line)		
362	10	0530
356	100	0532
353	(1r)	0534
.3 mi. N 353	(10r)	0536
396	10	0545
392	100	0542
388	(1r)	0540
.2 mi. NW 388	(10r)	0538
(N Stake Line)		
144	(20r)	0540
(NW Stake Line)		
268	10	0530
241	120	0532
235	(1r)	0534
300 yds SE 235	(10r)	0536
(E Stake Line)		
567	10	0532
50 yds W 562	100	0534
.1 mi W 560	(1r)	0536
.25 mi W 560	(10r)	0538

Stake No.	Intensity Mr/Hr	Time
(NE Stake Line)		
460	10	0546
555	100	0544
451	(1r)	0542
.17 mi SW 450	(10r)	0540
MORNING SURVEY - 2 June 1952		
(S Stake Line)		
359	10	0430
358	16	0431
357	20	0432
356	28	0433
355	34	0434
354	80	0435
353	100	0436
.1 mi N 353	120	0437
.2 mi N 353	300	0438
.3 mi N 353	800	0439
.7 mi N 353	(1r)	0442
1.3 mi N 353	(10r)	0443
(SE Stake Line)		
389	48	0449
390	22	0441
391	10	0447
.1 mi NW 391	100	0446
.2 mi NW 391	(1r)	0445
.3 mi NW 391	(10r)	0444
(E Stake Line)		
562	10	0446
561	22	0447
560	32	0448
559	100	0449
.3 mi W 559	(1r)	0450
.2 mi W 559	(10r)	0451
(NE Stake Line)		
454	10	0500
453	24	0458
452	46	0451
451	80	0456
450	100	0455

TABLE G.6 (Cont'd.)

Stake No.	Intensity Mr/Hr	Time	Stake No.	Intensity Mr/Hr	Time
.1 mi SW 450	460	0454	142	180	0503
.2 mi SW 450	(1r)	0453	141	200	0504
.3 mi SW 450	(10r)	0452	140	180	0505
			139	175	0506
(NW Stake Line)			138	200	0507
241	10	0430	137	200	0508
240	18	0431	136	200	0509
239	28	0432	135	200	0510
238	40	0433	134	220	0511
.05 mi SE 239	100	0434	133	300	0512
.1 mi SE 238	110	0435	132	300	0513
235	200	0436	131	340	0514
.2 mi SE 238	340	0437	130	350	0515
.2 mi SE 238	(1r)	0438	129	460	0516
.4 mi SE 238	(10r)	0439	128	580	0517
			127	550	0518
(SW Stake Line)			126	-	0519
505	10	0440	125	-	0520
.1 mi NE 505	22	0441	124	(1r)	0521
.2 mi NE 505	45	0442	123	(1r)	0522
			122	(1.4r)	0523
(SW Stake Line)			121	(1.6r)	0524
.3 mi NE 505	200	0444	120	(2r)	0525
.28 mi NE 505	100	0443	119	(1.8r)	0526
.4 mi NE 505	(1r)	0445	118	(1.6r)	0527
.5 mi NE 505	(3r)	0446	117	(2r)	0521
.55 mi NE 505	(10r)	0447			
			MORNING SURVEY - 3 June 52		
(W Stake Line)			(W Stake Line)		
420	10	0448	417	10	0435
419	30	0449	.2 E 417	100	0437
418	54	0450	.4 E 417	(1r)	0438
417	65	0451	.5 mi E 417	(10r)	0445
416	100	0452			
.1 mi E 416	200	0453	(NW Stake Line)		
.25 mi E 416	(1r)	0454	238	10	0500
.3 mi E 416	(10r)	0455			
			(SE Stake Line)		
(N Stake Line)			381	100	0504
149	250	0456	.2 mi NW 381	(1r)	0510
148	175	0457	.8 mi NW 383	10	0528
147	180	0453	.9 mi NW 383	100	0529
146	180	0459	.2 mi NW 384	(1r)	0530
145	200	0500	.2 mi NW 386	10	0535
144	200	0501	.3 mi NW 386	100	0536
143	180	0502	.8 mi NW 386	(1r)	0537

TABLE G.6 (Cont'd.)

Stake No.	Intensity Mr/Hr	Time
(E Stake Line)		
.2 mi W 560	100	0512
.3 mi W 560	(1r)	0513
(S Stake Line)		
.2 mi W 359	10	0519
.4 mi N 359	100	0519
.5 mi N 359	(1r)	0520
.6 mi N 359	(1r)	0521
MORNING SURVEY - 2 June 1952 - T-7 AREA		
(S Stake Line)		
19	10	0430
15	100	0432
(W Stake Line)		
85	10	0520
75	100	0522
(SW Stake Line)		
43	10	0445
41	100	0450
400 yds SW gz	(1r)	0455
(NE Stake Line)		
160	10	0510
161	100	0512
162	(1r)	0515
(SE Stake Line)		
241	10	0520
243	100	0523
244	(1r)	0525
(SW Stake Line)		
35	100	0528
33	(1r)	0530
(E Stake Line)		
139	80	0531
198 & 199	12	0533
(SE Stake Line)		
214 - 219	90	0534-6
(S Stake Line)		
17	10	0500
13	100	0503
200 yds S GZ	(1r)	0505
250 yds SE GZ	(1r)	0510
(W Stake Line)		
75	100	0512
77	10	0513
1 mi W 77	100	0514
(SW Stake Line)		
43	10	0520
41	100	0522
(W Stake Line)		
81	30	0527
85	10	0530
.5 mi W of 85		0535

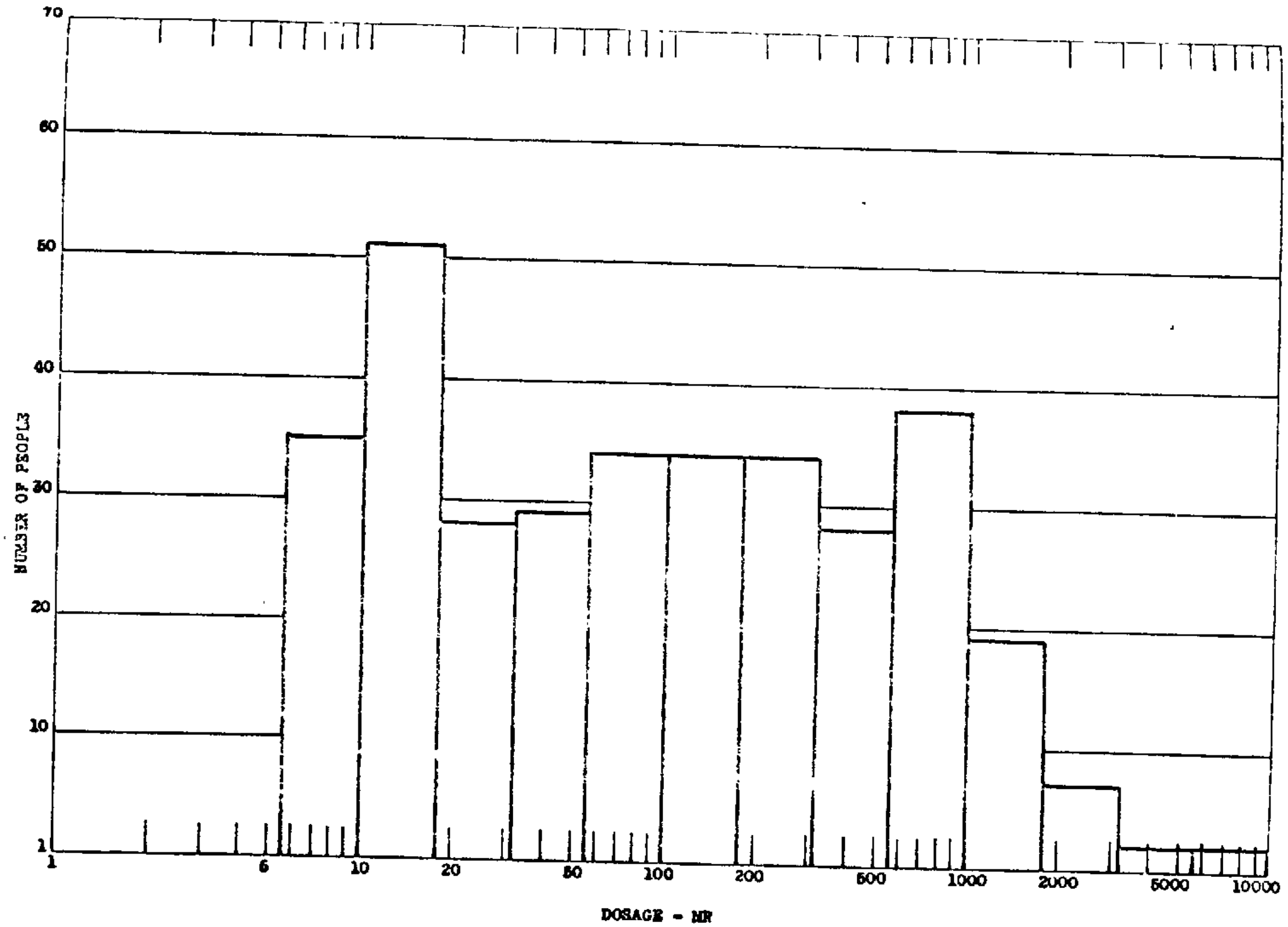


Fig. G.10 Accumulated Dose Report (For Personnel Issued Film Badges During Period G to H-1 Days)

APPENDIX H

OPERATION TUMBLER-SNAPPER
Shot 8 - 5 June 1952
(Period Covered: 5 June-9 June 1952)

OPERATIONAL DATA

Location: T-2 Area
Height of Burst: 300 ft.
Yield (KT): 14
Time Fired: 0355 (PST)

OPERATION TUMBLER-SNAPPER
Shot 8 - 5 June 1952

H.1 OFF-SITE OPERATIONS DEPARTMENT

On 5 June 1952 at 0355, a [redacted] weapon was detonated in the T-2 Area on a 300-foot tower. This was the last shot in this scheduled series. While most of the previous fall-out occurred in the northeast and east sectors, most of the fall-out from the eighth shot occurred in the northwest quadrant. Again, none of the populated areas received sufficient fall-out to cause concern. The area in the vicinity of Groom Mine received the maximum, with intensity readings of from 160 to 280 mr/hr occurring at approximately one and one-half to two hours after shot time. For approximately 10 days after H+2 hours the Off-Site Department personnel rechecked all areas surrounding NPG where any readings above 20 mr/hr had been reported. Additional checks were made in all areas thought to be necessary from the composite fall-out plots. All the water holes and potable water sources in these areas were sampled and the samples were analyzed by the Rad-Safe Laboratory to determine their concentration of radioactivity. None of the samples contained any appreciable amount of radioactive material. Tables H.1 through H.5 and Figs. H.1 through H.3 show the data collected from this shot by Off-Site Operations Department.

H.2 MATERIEL AND LOGISTICS DEPARTMENT

By 6 June 300 sets of protective clothing, 90 MX-5's and 160 T1B's had been issued. The personnel of the Materiel and Logistics Department, who had been on 24-hour basis for several months, were returned to normal duty hours. The roll-up phase was well under way by 9 June, with the departure of Project 6.1, near completion of inventories by the Supply and Instrument Repair Sections, and the return to Test Command and the AEC of most of the vehicles loaned to Rad-Safe.

H.3 ON-SITE OPERATIONS DEPARTMENT

Since the direction of the lower winds caused the long axis of the contaminated area to be in the northwest quadrant, a large amount of the contamination was found in the mountains to the northwest of the T-2 Area. No effort was made to close the isointensity lines of this shot since there was no need for recovery personnel to enter this area.

Information collected from this shot is shown in Table H.6 and Figs. H.4 through H.6.

TABLE H.1

Ground Mobile Monitors' Report - Shot 8 - 5 June 1952
(See Fig. E.1) (Normal background: .02 - .04 mr/hr).

TIME	READING Mr/Hr	GRID LOCATION (Ref.Fig. E.1)	LOCATION IN DETAIL	REMARKS
0335	.5	E2 S2	Groom Mine	Background
0345	.1-.2	E2 S4	Lincoln Mine	Background
0400	.03-.06	C5 RO	Tonopah	Tonopah (0400) to Goldfield (0445) and Return (0550)
0416	.6	E2 S2	Groom Mine	Cloud overhead
0420	3.0	D5 S4	5 mi. E of Reed	to NW, traveling toward NE
0420	.6	E2 S2	Groom Mine	Main portion of cloud top passed to NW from Groom
0430	.05	G5 RO	Tonopah	From Tonopah to 45 mi. NE on US6
0433	.5-.6	E2 S2	Groom Mine	Top of Cloud in E by NE Bottom to W of top
0439	.5	E2 S2	Groom Mine	Reading background until last last reading (Reading taken at1030 hours.)
0445	.2	E2 S4	Lincoln Mine	Reading background until last reading at 1600 hrs.
0445	13	EO S1	12 mi. N of CP to Groom	
0450	160	EO S1	13 mi. N of CP to Groom	
0451	230	EO S1	13.5 mi. N of CP to Groom	
0455	130	EO S1	14 mi. N of CP to Groom	
0457	160	EO S1	15 mi. N of CP to Groom	
0500	60	EO S2	15.5 mi. N of CP to Groom	
0503	20	EO S2	16.5 mi. N of CP to Groom	
0505	30	EO S1	18 mi. N of CP to Groom	
0508	10	EO S2	19 mi. N of CP to Groom	
0510	9	EO S2	Station 17	
0515	.15	E2 S4	Station 8	
0518	.04	D3 R1	Warm Springs	
0520	5	E1 S2	Station 14	
0520	.4	E3 S3	Station 3	

TABLE H.1 (Cont'd.)

TIME	READING Mr/Hr	GRID LOCATION (Ref.Fig. E.1)	LOCATION IN DETAIL	REMARKS
0525	.2	D4 R2	14 mi. NE of Warm Springs	
0530	.2-.4	E3 S2	Station 2	
0545	.06	D3 R1	45 mi. E of Tonopah on US 6	
0550	.13	E2 R4	40 mi. NE of Warm Springs	
0600	.08	D4 R1	2 mi. NE of Warm Springs on US 6	
0602	.35	E2 R3	49 mi. NE of Warm Springs	
0615	0	E3 R0	Currant	
0615	.08	D3 R1	2 mi. W of Warm Spgs. on US 6	From here to 17 Mi. NE of Warm Springs
0630	.04	C4 R0	Tonopah	
0634	.04	D2 R1	17 mi. W of Warm Spgs. on US 6	
0634	.02	E0 T4	Jct US 95/Mercury Rd	From here to Beatty, (0745)
0642	.06	D2 R1	24 mi. W of Warm Springs on US 6	
0645	.8	E3 S2	Station 5	
0651	.05	D1 R1	30 mi. N of Warm Springs on US 6	
0655	1.5	E3 S2	3 mi. W of Station 5	
0657	.03	D1 R1	35 mi. W of Warm Springs on US 6	
0700	.03	C4 R4	Goldfield	From Goldfield to Beatty (0345)
0700	.04	D5 R1	12 mi. S of Warm Spgs.	
0701	.03	D0 R0	40 mi. W of Warm Spgs.	
0703	.7	E1 R3	5 mi. E of Lockes on US 6	
0705	1.4	E1 R3	Lockes, Nev.	Seemed to be present only in the valley
0707	.05	D0 R0	45 mi. W of Warm Spgs. on US 6	
0710	0.13	D5 R3	30 mi. NE of Warm Spgs. on US 6	
0715	.06	C5 R0	Tonopah Airport	
0715	.5	E3 S2	10 mi. W of Station 5	
0720	.3	D5 R1	Twin Spgs. (About 19 mi. S of Warm Spgs.)	
0727	.05	C5 R0	Tonopah, Nev.	
0730	0.15	D5 R3	18 mi. NE of Warm Spgs. on US 6	
0730	5	E0 R0	22 mi. S of Warm Spgs.	
0730	1.5	E2 S2	4 mi. N of Groom Lake	
0740	5	E0 R0	28 mi. S of Warm Spgs.	
0745	7	E0 R0	32 mi. S of Warm Spgs.	
0745	.02	D1 S0	Beatty, Nev.	
0745	0.5	D4 R1	4 mi. Ne of Warm Spgs.	
0748	8.5	D3 R1	Warm Spgs.	
0800	4	E0 S5	Warm Spgs.—Reed Junction	
0800	.05	C5 R0	Tonopah Airport	

TABLE H.1 (Cont'd.)

TIME	READING Mr/Hr	GRID LOCATION (Ref.Fig. E.1)	LOCATION IN DETAIL	REMARKS
0805	6	E0 S5	3 mi. from Station 43	
0810	14	E0 S5	7mi. from Station 43	
0815	.05	C5 R0	9 mi. E of Tonopah at US 6	
0815	13	D5 S5	Reed	
0820	.4	E2 S2	4 mi. N of Groom Mine	
0820	11	D5 S4	4 mi. W of Reed	
0820	.8	D0 R0	15 mi. E of Tonopah on US 6	
0820	10.5	D4 R1	Warm Spgs.	From Warm Spgs. S to 4 mi. E
0821	4.0	R1 D2	16 mi. NE of Tonopah	
0822	9	R1 D2	17 mi. NE of Tonopah	
0823	11	R1 D2	17 mi. NE of Tonopah	
0825	7	R1 D2	18 mi. NE of Tonopah on US 6	
0829	6.0	D4 Q2	Tyho Junction (N of Warm Spgs.)	
0830	8	R1 D2	21 mi. NE of Tonopah on US 6	
0830	.6	E2 S2	12 mi. N of Groom Mine	
0830	11	D5 S4	Reed	
0835	5	R2 D2	26 mi. NE of Tonopah on US 6	
0840	22	R2 D2	30 mi. NE of Tonopah on US 6	
0840	6.0	D5 Q4	Hot Creek Jct. (North of Warm Spgs.)	
0841	33	D2 R2	30 mi. NE of Tonopah on US 6	
0845	44	D2 R2	35 mi. NE of Tonopah on US 6	
0845	.03	D1 R0	Beatty	Beatty to Tonopah (1025)
0846	3.5	D4 R2	15 mi. NE of Warm Spgs. on US 6	
0850	40	R3 D3	36 mi. NE of Tonopah on US6	
0850	3	E0 S4	3.5 mi. SE of Station 43	
0850	.1	E3 S2	Station 2	
0900	3.3	E1 R3	Lockes	
0900	5	E0 S4	8 mi. SE of Station 43	
0900	40	D3 R3	38 mi. E of Tonopah on US 6	
0905	36	D3 R3	39 mi. E of Tonopah on US 6	
0905	.2	E1 S4	15 mi. NW of Lincoln Mine	From here to Lincoln
0906	28	D2 R1	40 mi. E of Tonopah on US 6	
0908	14	D2 R1	41 mi. E of Tonopah on US 6	
0910	16	D2 R1	42 mi. E of Tonopah on US 6	
0915	15	D3 R1	46 mi. E of Tonopah on US 6	
0916	10	D3 R1	47 mi. E of Tonopah on US 6	
0917	3.5	E3 R4	Currant	From Currant to Lockes
0920	6	D3 R4	49 mi. NW of Tonopah on US 6	
0923	.3	E2 S4	Lincoln Mine	
0930	.3	E5 S4	2 mi. W of Crystal Spgs. on Nev. 38	

TABLE H.1 (Cont'd.)

TIME	READING Mr/Hr	GRID LOCATION (Ref.Fig. E.1)	LOCATION IN DETAIL	REMARKS
0938	.2	E5 S4	6 Mi. W of Crystal Spgs. on Nev. 38	
0940	3	E3 R4	Currant	
0945	6	D3 R4	Warm Springs	
0945	.3	E5 S4	10 mi. N of Crystal Spgs. on Nev. 38	
0950	.2	E2 S4	Station 6	
0950	.2	E5 S4	12 mi. N of Crystal Spgs. on Nev. 38	
0950	4	D3 R4	5 mi. SW of Warm Spgs. on US 6	Rain shower
0955	.15	E5 S4	14 mi. N of Crystal Spgs. on Nev. 38	
0955	8	D3 R3	9 mi. SW of Warm Spgs. on US 6	
0956	3.5	E1 R3	Lockes	
0958	.1	E5 S4	16 mi. N of Crystal Spgs. on Nev. 38	
1000	13	D3 R3	12 mi. SW of Warm Spgs. on US 6	
1000	.2	E5 S4	18 mi. W of Crystal Spgs. on Nev. 38	
1003	.15	E5 S4	20 mi. N of Crystal Spgs. on Nev. 38	
1005	15	D3 R3	16 mi. SW of Warm Spgs. on US 6	
1006	45	D3 R3	17 mi. SW of Warm Spgs. on US 6	
1008	38	D3 R3	18 mi. SW of Warm Spgs. on US 6	
1010	36	D2 R2	19 mi. SW of Warm Spgs. on US 6	
1012	30	D2 R2	20 mi. SW of Warm Spgs. on US 6	
1015	18	D2 R2	22 mi. SW of Warm Spgs. on US 6	
1017	10	D2 R2	24 mi. SW of Warm Spgs. on US 6	
1018	5	D2 R2	25 mi. SW of Warm Spgs. on US 6	
1020	3.35	D4 Q3	Hot Creek Junction	
1025	6	D2 R2	30 mi. SW of Warm Spgs. on US 6	
1025	.03	C4 R0	Tonopah, Nev.	
1032	6	D2 R2	35 mi. SW of Warm Spgs. on US 6	
1033	8	D2 R2	36 mi. SW of Warm Spgs. on US 6	
1036	5	D2 R2	38 mi. SW of Warm Spgs. on US 6	
1038	3	D2 R2	40 mi. SW of Warm Spgs. on US 6	
1047	8	D3 R1	Warm Springs	
1055	13.5	D3 R1	10 mi. W of Warm Spgs. on US 6	
1100	34	D2 R1	Clark's Station	
1106	18	D2 R1	5 mi. SW of Clark's Station	
1120	6	D2 R1	34 mi. W of Warm Spgs.	
1300	25	D2 R1	34 mi. E of Tonopah on US 6	
1330	17	D2 R1	34 mi. E of Tonopah on US 6	
1400	14	D2 R1	34 mi. E of Tonopah on US 6	
1450	12	D2 R1	34 mi. E of Tonopah on US 6	
1500	18	D2 R1	23 mi. E of Tonopah on US 6	Started raining Wind Speed increasing variable from South

TABLE H.2

Aerial Terrain Survey Report (Badger I & II and Woodchuck II) - **Shot 8** - 5 June 1952
(See Fig. A.2) **(Code: Badger - C-47 aircraft. Woodchuck - L-20.)**

Report Number	Grid Position (Ref. Fig.A.2)	Time of Report (PST)	Altitude Absolute (Ft.)	B-21 Meter Reading (Millivolts B.G./B.G.Cont.)	Rate Meter Reading (Counts/Min)	Geiger-Mueller Reading (Mr/Hr)
(5 June 1952)						
Badger I						
1	405	0627	1000	115/140	100	0
2	4A4	0632	400	115/135	100	0
3	4B3	0638	500	140/150	100	0
4	4C2	0643	500	3500/4500	100	6.0
5	4D1	0649	1000	3000/5700	150	0.5
6	4E0	0655	1000	1000/2300	175	0.3
7	4F0	0659	1000	450/600	175	0.2
8	4E1	0707	1000	700/1100	175	0.3
9	4D2	0713	500	2000/4000	200	3.0
10	4C3	0719	1000	1000/4300	200	0
11	4B4	0724	500	135/155	200	0
12	4A5	0729	1000	140/195	200	0
13	4A6	0735	1500	120/125	200	0
14	4B5	0741	500	130/165	200	0
15	4C4	0747	500	140/160	200	0
16	4D3	0752	400	4000/6100	200	11
17	4E2	0759	400	3000/6000	200	1.8
18	4F1	0805	400	900/2250	200	0.5
19	4G0	0811	1000	500/1100	200	0.05
20	4H0	0815	500	500/830	200	0.2
21	4G1	0822	800	550/850	200	0.2
22	4E2	0827	1000	550/750	200	0.1
23	4E3	0833	800	1000/2000	200	5.0

TABLE H.2 (Cont'd.)

Report Number	Grid Position (Ref. Fig.A.2)	Time of Report (PST)	Altitude Absolute (Ft)	B-21 Meter Reading (Millivolts B.g./B.G.Cont.)	Rate Meter Reading (Counts/Min)	Geiger-Mueller Reading (Mr/Hr)
24	4D4	0839	1000	2300/4000	200	0.05
25	4C5	0846	1000	145/175	200	0
26	4B6	0851	500	140/160	200	0
27	4A7	0858	1000	140/165	200	0
28	4A8	0902	500	145/165	200	0
29	4A9	0905	1500	135/145	200	0
30	4B8	0911	500	140/150	200	0
31	4C7	0916	800	140/150	200	0
32	4D6	0922	1000	145/165	200	0
33	4E5	0927	500	145/170	200	2
34	4F4	0933	500	2500/4250	200	5
35	4G3	0939	500	3000/4100	200	0.3
36	4H2	0945	1000	450/650	200	2.0
37	4I1	0951	1000	500/790	200	0
38	4J0	0958	500	400/600	200	0.05
39	4J1	1001	1000	300/590	200	0.05
40	4J2	1006	500	450/710	200	0.1
41	4I3	1014	1000	600/940	200	0.3
42	4E4	1022	1000	800/1000	200	0.6
43	4G5	1027	1000	800/1500	200	0.3
44	4F6	1033	500	700/2100	200	0
45	4E7	1038	500	140/190	200	0
46	4D8	1045	500	135/155	200	0
47	4C9	1053	500	140/165	200	0
48	4B10	1058	1000	135/140	200	0
WOODCHUCK II*						
1	4O1	0641	10	0		
2	1B0	0654	20	5		

*Reading less Background

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TABLE H.2 (Cont'd.)

Report Number	Grid Position (Ref.Fig.A.2)	Time of Report (PST)	Altitude Absolute (Ft)	B-21 Meter Reading (Millivolts B.G./B.G.Cont.)	Rate Meter Reading (Counts/Min)	Geiger-Mueller Reading (Mr/Hr)
3	1C1	0703	20	0		
4	402	0730	20	0		
5	4A2	0737	30	0		
6	1C0	0757	20	.6		
7	1D0	0704	20	.2		
8	404	0738	20	0		
(6 June 1952)						
BADGER I						
1	2F5	0720	1000	90/95	200	0
2	2G3	0730	500	95/115	200	0
3	4G1	0745	1000	100/125	200	0
4	4C5	0806	500	100/120	100	0
5	408	0826	500	95/105	100	0
6	4B6	0836	500	120/175	100	0
7	4D8	0848	500	120/130	100	0
8	4G5	0856	600	115/130	100	0
9	4G2	0910	500	500/1000	100	0.05
10	1G3	0925	1000	45/80	100	0
11	1 (C.6) 7	0947	1000	125/280	100	0
12	1C9	0956	300	125/180	100	0
13	103	1008	1000	110/140	100	0
14	2B8	1017	1000	100/120	100	0
15	2E5	1038	1000	100/140	100	0
BADGER II						
1	2D3	0707	900	135/135	500	.07
2	2E5	0714	1000	130/130	500	.08
3	2E0	0729	1400	140/165	500	.07

TABLE II.2 (Cont'd.)

Report Number	Grid Position (Ref. Fig. A.2)	Time of Report (PST)	Altitude Absolute (Ft)	B-21 Meter Reading (Millivolts B.g./B.G.Cont.)	Rate Meter Reading (Counts/Min)	Geiger — Mueller Reading (Mr/Hr)
4	3C3	0748	1500	145/155	500	.07
5	3½A4½	0804	2500	145/150	500	.08
6	4D4	0821	1700	160/390	500	.09
7	4D½2	0829	1800	140/260	500	.09
8	1D2	0840	1200	160/235	500	.09
9	1C3	0845	1400	160/180	500	.08
10	1B5	0853	1200	160/190	500	.07
11	105	0902	1000	160/160	500	.07
12	2B4	0931	1000	160/180	500	.07

TABLE II.3

Aerial Cloud Trackers Report - (Hounddog I and IV) - **Shot 8** - 5 June 1952 (See Fig. A.2)
(Code: Hounddog - B-29 aircraft).

Report Number	Grid Position (Ref.Fig. A.2)	Time of Report (PST)	Mean Sea Level Altitude (Ft)	B-21 Meter Reading (Millivolts B.G./B.G.Cont.)	Rate Meter Reading (Counts/Min)	Geiger - Mueller Reading (Mr/Hr)
HOUNDDOG I						
1	1O2	0450	18,000			1.5
2	1B4	0458	18,000			.4
3	1D6	0506	18,000			.1
4	1C4	0512	18,000			.3
5	1D2	0516	18,000			1
6	4D0	0521	18,000			6
7	4C1	0526	18,000			30
8	4B4	0530	18,000			.5
9	4O2	0535	18,000			35
10	4D1	0551	22,000			45
11	4F1	0554	22,000			5
12	1E2	0559	22,000			.6
13	1F4	0605	22,000			.6
14	1F7	0611	22,000			.6
15	1G9	0618	22,000			.4
16	1G6	0625	22,000			.6
17	1H3	0632	22,000			.7
18	4I3	0646	22,000			1.8
19	4E6	0658	18,000			1.3
20	4E5	0702	18,000			1.1
21	4C2	0711	18,000			1.1
22	4F1	0718	18,000			1.3
23	4A1	0730	18,000			1.5
24	4L1	0724	18,000			1.6
25	4M4	0747	22,000			1.5

TABLE H.3 (Cont'd.)

Report Number	Grid Position (Ref. Fig. A.2)	Time of Report (PST)	Mean Sea Level Altitude (Ft)	B-21 Meter Reading (Millivolts B.G./B.G.Cont.)	Rate Meter Reading (Counts/Min)	Geiger-Mueller Reading (Mr/Hr)
26	4K4	0751				2.5
27	4H5	0811	22,000			2
28	4N2	0830	22,000			3
29	4L4	0840	19,000			5
30	4L5	0846	19,000			3
HOUNDDOG IV						
1	4A1	0430	9,000			.2
2	4C1	0435	9,000			.2
3	4A2	0439	9,000			2.0
4	4A1	0441	9,000			.5
5	001	0444	14,000			100
6	4B3	0454	14,000			.2
7	4C2	0458	14,000			13.0
8	4D2	0501	14,000			5.0
9	4B1	0504	14,000			1.0
10	4C1	0509	14,000			20.0
11	0C0	0511	14,000			1.0
12	4C1	0514	14,000			10.0
13	4B1	0516	14,000			.5
14	4C4	0519	14,000			.8
15	4D4	0523	14,000			20.0
16	4D3	0529	14,000			.5
17	4C1	0532	9,500			20.0
18	4B1	0534	9,000			5.0
19	4A1	0538	9,000			14.0
20	4B2	0542	9,000			5.0
21	4C4	0545	9,000			5.0

TABLE H.3 (Cont'd.)

Report Number	Grid Position (Ref.Fig. A.2)	Time of Report (PST)	Mean Sea Level Altitude (Ft)	B-21 Meter Reading (Millivolts B.G./B.G.Cont.)	Rate Meter Reading (Counts/Min)	Geiger-Mueller Reading (Mr/Hr)
22	4D5	0547	9,000			5.0
23	4D4	0559	9,000			.5
24	4C4	0608	14,000			2.0
25	4D4	0613	14,000			4.0
26	4D5	0616	14,000			9.2
27	4E5	0625	14,000			1.5
28	4E4	0627	14,000			100.0
29	4D5	0636	14,000			10.0
30	4E4	0702	14,000			3.0
31	4E5	0704	13,000			1.5
32	4E6	0705	13,000			4.0
33	4E5	0711	9,000			4.0
34	4E4	0713	9,000			3.0
35	4E4	0714	9,000			1.0

TABLE H.4

Fixed Air Sampling and Fall-out Tray Report - Shot 8 - 5 June 1952 *

CODE	STATION	AIR CONCENTRATION IN $\mu c/m^3$ (Hi-Vol) 1 Hr.	24 Hrs.	FALL-OUT TIME AFTER H-HOUR	FALL-OUT TRAYS d/m	Part/Tray	μc/Part	PARTICLE SIZE MMD	%<5μ	BACKGROUND RECORDER Arrival Time	High Reading mr/hr
CP	CP	5.99×10^{-3}	667×10^{-6}	3.5	TLC	-	-	-	-	-	——
M	MERCURY	——	1.24×10^{-3}	(4)	TLC	-	-	-	-	-	Bkgd.
IS	INDIAN SPGS	——	2.42×10^{-3}	(4)	TLC	-	-	-	-	-	Bkgd.
LV	LAS VEGAS	——	376×10^{-6}	(3)	TLC	-	-	-	-	-	Bkgd.
NE	NELLIS AFB	——	208×10^{-6}	(8)	TLC	-	-	-	-	-	Bkgd.
GJ	GLENDALE JCT	——	935×10^{-6}	(8)	TLC	-	-	-	-	-	Bkgd.
AL	ALAMO	17.5×10^{-3}	5.29×10^{-3}	2.5	TLC	-	-	1.1	98	-	Bkgd.
CS	CRYSTAL SPGS	20.2×10^{-3}	9.19×10^{-3}	2.5	TLC	-	-	-	-	-	Bkgd.
CA	CALIENTE	——	4.38×10^{-3}	(3)	TLC	-	-	-	-	-	Bkgd.
PI	PIOCHE	——	4.54×10^{-3}	(3)	1.83×10^{6}	-	-	-	-	-	Bkgd.
EL	ELY	——	1.05×10^{-3}	(9)	TLC	-	-	-	-	-	Bkgd.
CU	CURRANT	——	2.75×10^{-3}	(5)	1.62×10^{6}	-	-	-	-	5.13	1.7
WS	WARM SPRINGS	——	4.00×10^{-3}	(3.75)	18.0×10^{6}	-	-	-	-	3.75	9.2
TO	TONOPAH	——	1.45×10^{-3}	(5)	148×10^{3}	-	-	-	-	-	——
BE	BEATTY	——	595×10^{-6}	(4)	TLC	-	-	-	-	-	Bkgd.
GM	GROOM MINE	57.2×10^{-3}	12.5×10^{-3}	(1)	TLC	-	-	-	-	-	Bkgd.
LM	LINCOLN MINE	131×10^{-3}	7.29×10^{-3}	(2)	TLC	-	-	1.4	84	-	Bkgd.
GO	GOLDFIELD	——	986×10^{-6}	(5)	TLC	-	-	-	-	-	——

*See Explanatory Notes - (Page 79)

TABLE H.5

Wind Information at CP Starting 0400 (PST) - Shot 8 - 5 June 1952

Altitude in Feet M. S. L.	Direction in Degrees	Speed in Knots
7	180	05
5	130	10
9	140	16
10	130	17
12	130	13
14	120	20
15	130	20
16	140	17
18	150	14
20	160	19
22	170	21
24	190	25
25	180	25
26	160	26
28	170	26
30	180	19
35	210	45
40	200	47
43	200	44

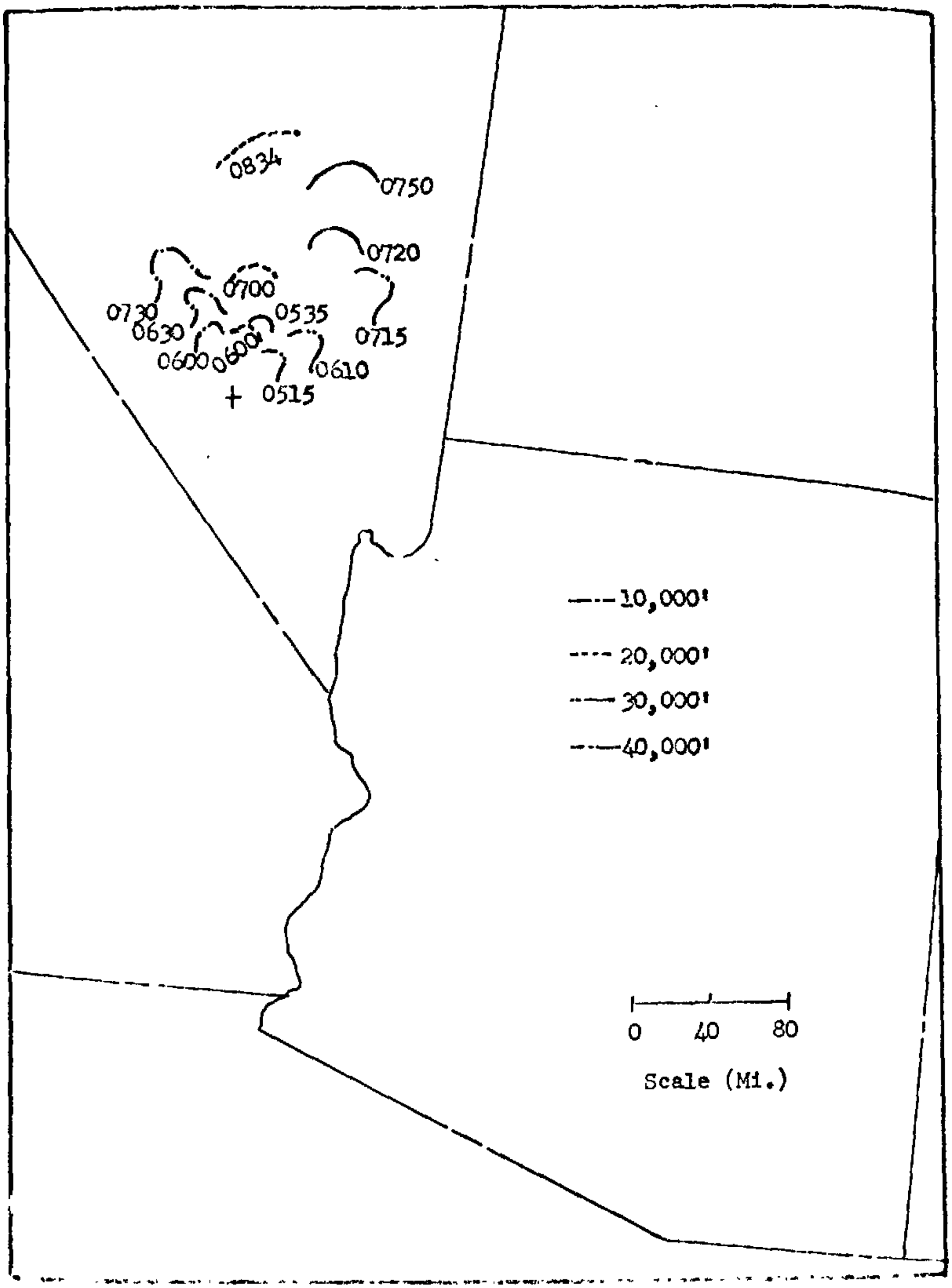

Fig. E.1 Cloud Progression, Shot 8

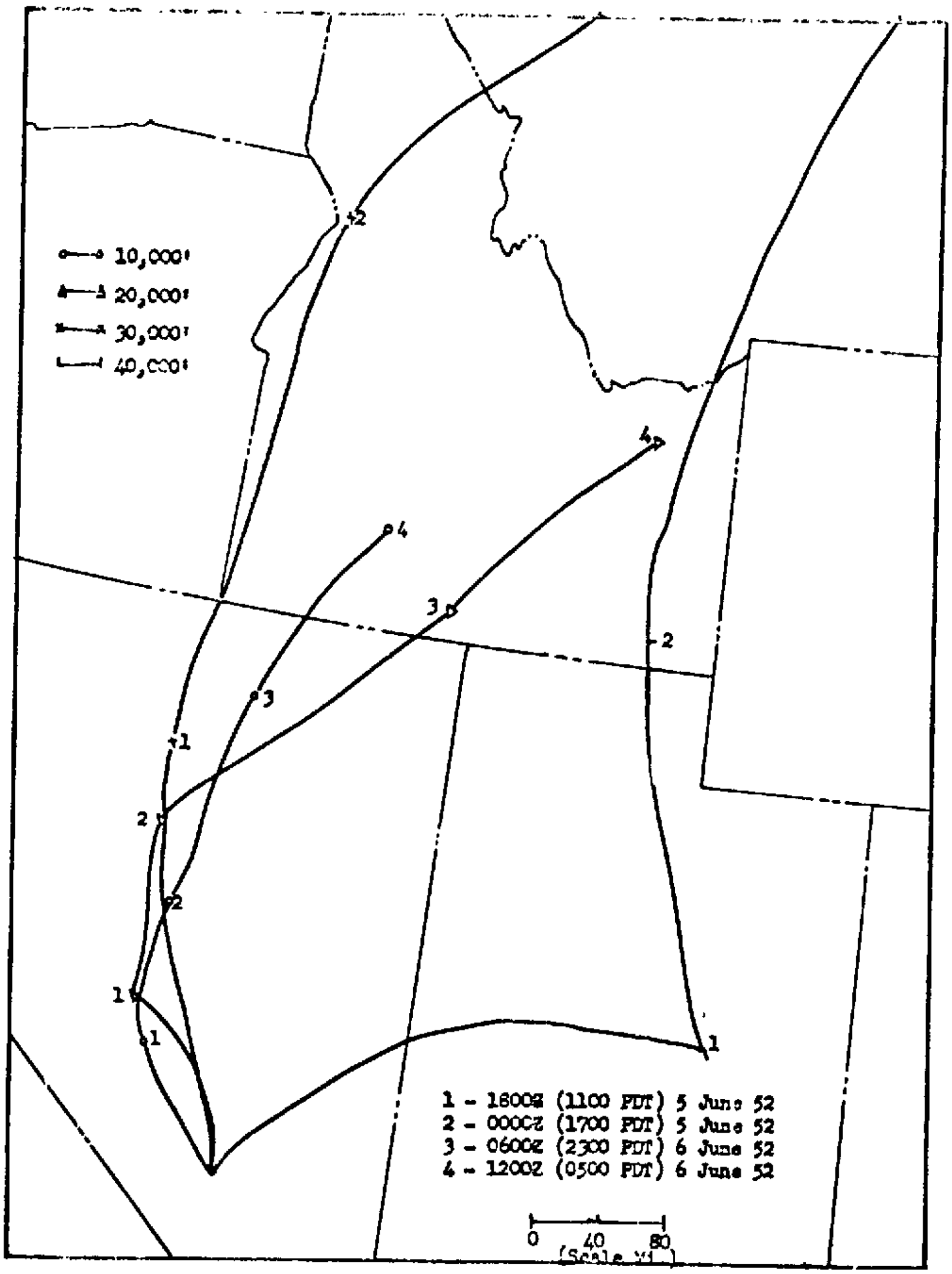

Fig. H.2 Cloud Trajectory, Shot 8

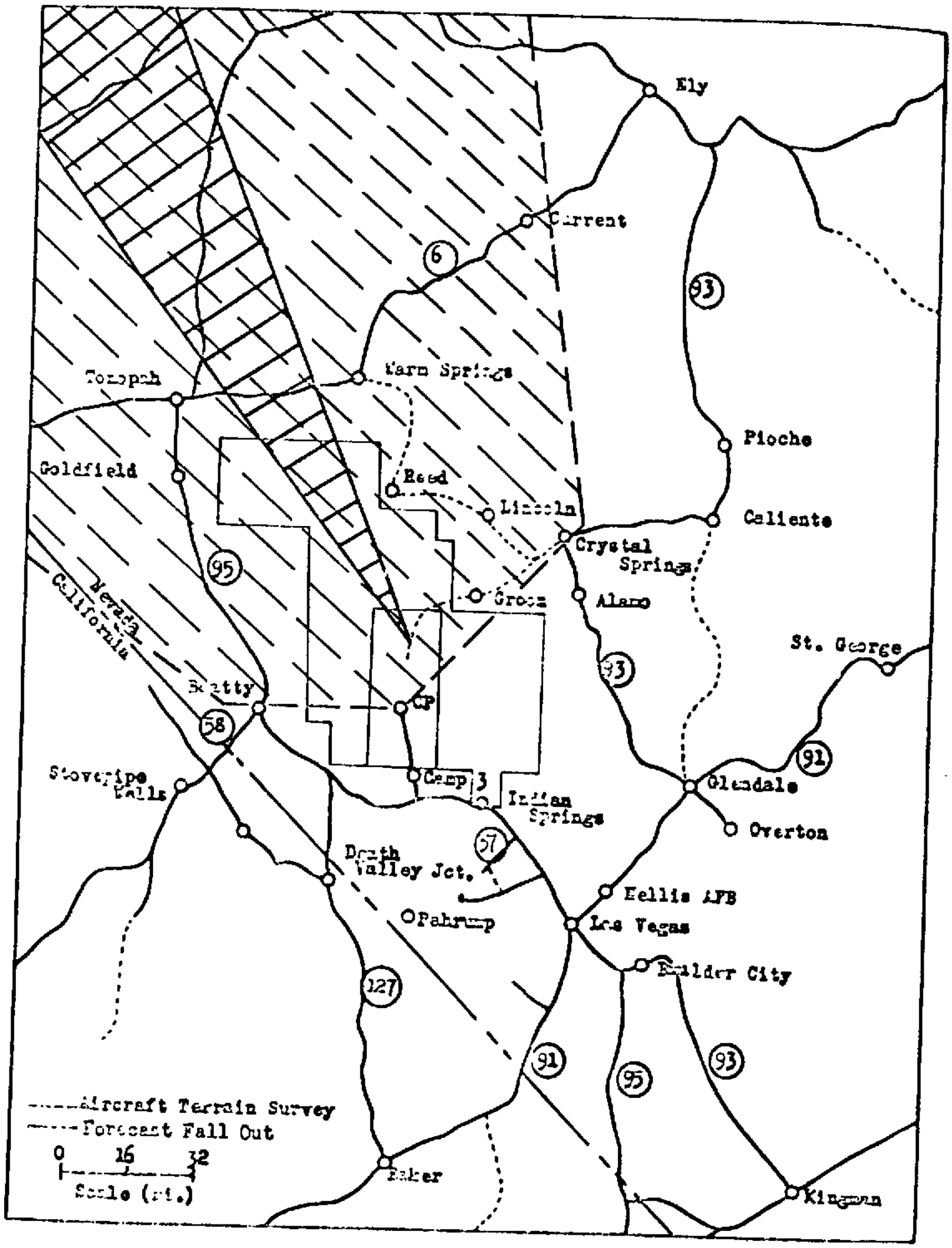

Fig. H.3 Fall-out Forecast and Area Covered by Surveys, Shot 8

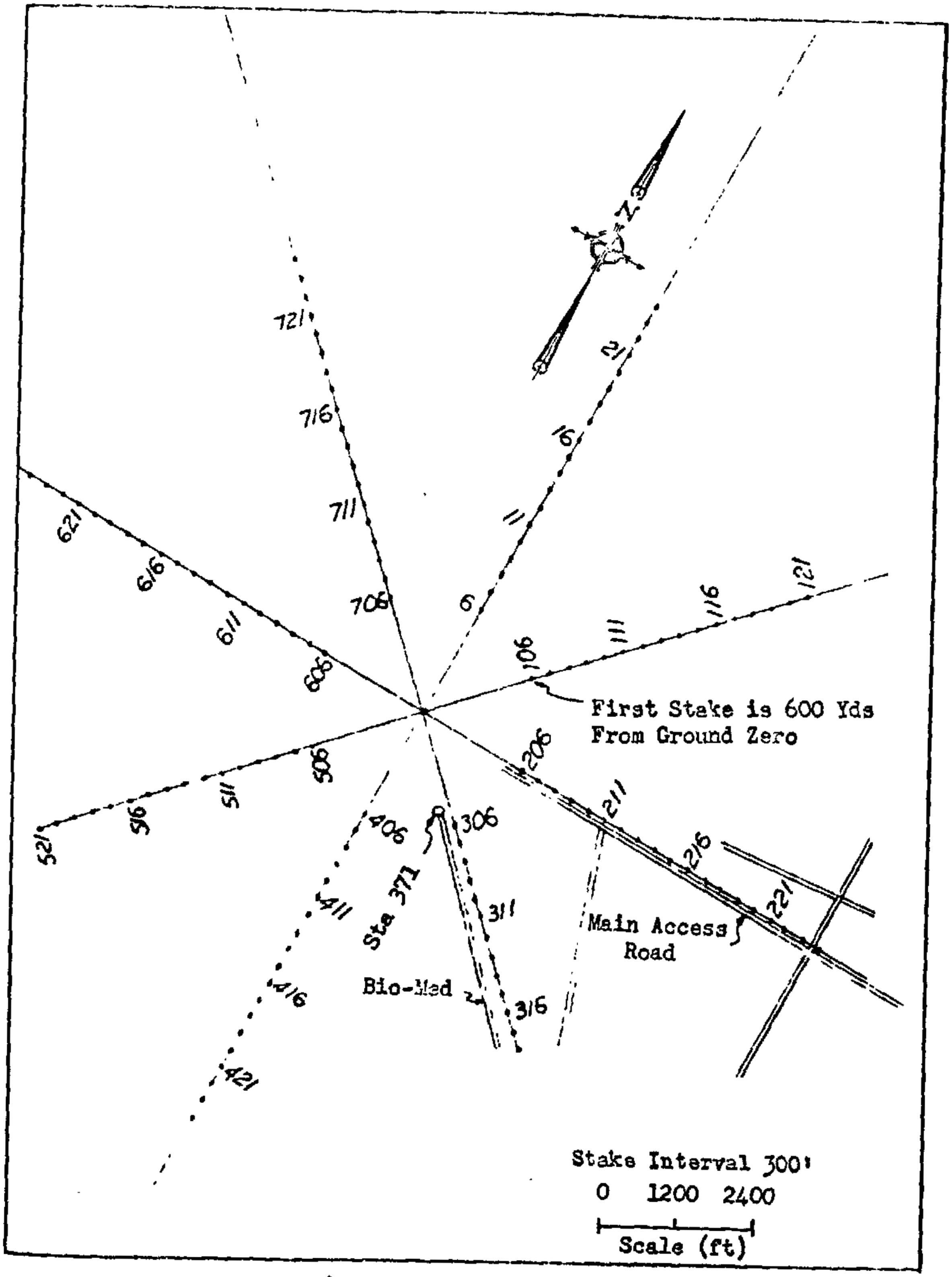

Fig. H.4 Plan - Area 2, Shot 8

TABLE H.6

Monitors' Survey Report - Shot 8 - 5 June 1952

Stake No.	Intensity Mr/Hr	Time
(Initial Survey - 5 June 52)		
(E Stake Line)		
.4 mi E 256	40	0548
237	10	0610
.1 mi W 210	100	0620
.3 mi W 210	1000	0615
.45 mi W 210	10R	0625
(NE Stake Line)		
118	10	0645
112	100	0650
109	1R	0654
106	10R	0659
(N Stake Line)		
23	10	0915
17	100	0925
11	1000	0935
Between 5 & 6	10R	0940
(SE Stake Line)		
316	10	0550
311	100	0555
307	1R	0600
.1 mi NW 307	10R	0605
(S Stake Line)		
414	10	0610
409	100	0615
406	1R	0620
.2 mi N 406	10R	0625
(SW Stake Line)		
521	10	0545
516	100	0550
511-12	1R	0555
1 mi NE 510	10R	0600
(Morning Survey - 6 June 1952)		
(E Stake Line)		
211	10	0600
.2 mi W 210	100	0605
.4 mi W 210	1R	0610
100 yds E GZ	10R	0615
Station 300	40	0620
(N Stake Line)		
16	10	0640
10	100	0645
.025 mi S 7	1R	0650
(SW Stake Line)		
515	10	0530
511	100	0535
.1 mi NE 510	1R	0540
(W Stake Line)		
614	10	0550
611	100	0550
609	1R	0600
(SE Stake Line)		
310	10	0500
307	100	0503
306	190	0505
Station 330	1R	0505
(S Stake Line)		
409	10	0525
406	100	0600
200 yds N 406	1R	0605
(Morning Survey - 7 June 1952)		
(E Stake Line)		
.1 mi W of 210	10	0530
.2 mi W of 210	100	0531
.25 mi W of 210	1R	0532
.30 mi W of 210	10R	0533
(NE Stake Line)		
111	10	0534

TABLE H.6 (Cont'd.)

Stake No.	Intensity Mr/Hr	Time	Stake No.	Intensity Mr/Hr	Time
.1 mi SW 112	100	0535	.20 mi NW Bunker		
.2 mi SW 112	1R	0536	(Sta. 330)	1R	0534
Ramp to Sta. 300	300	0533			
Perimeter Sta.			(S Stake Line)		
300	300	0540	408	10	0536
			.2 mi N 408	100	0538
(SW Stake Line)			.35 mi N 408	1R	0540
513	10	0520			
508	100	0523	(N Stake Line)		
100 yds NE 506	1R	0525	16	10	0550
400 yds NE 506	10R	0527	50 yds N of 7	100	0555
			.2 mi S of 7	1R	0600
(W Stake Line)			.5 mi W 25	10	0607
613	10	0535	.7 mi W 25	100	0615
610	100	0538	1 mi W of 25	1R	0625
606	1R	0540			
(SE Stake Line)					
308	10	0530			
.10 mi NW 307	100	0532			

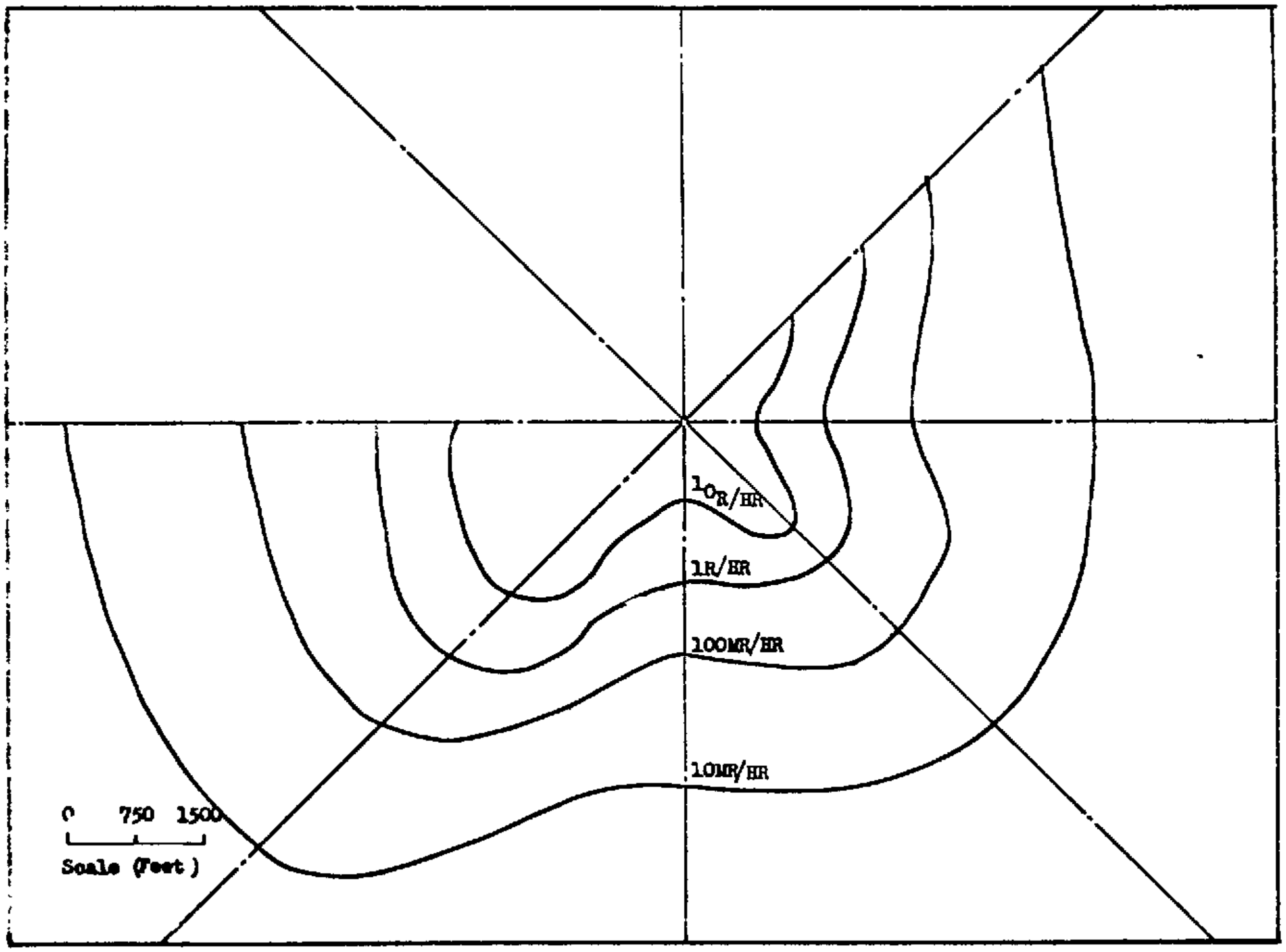

Fig. H.5 Isointensity Overlay, 0600 PST, Shot 8, (H-Hour: 0355 PST) (See Fig. H.4), 5 June 1952

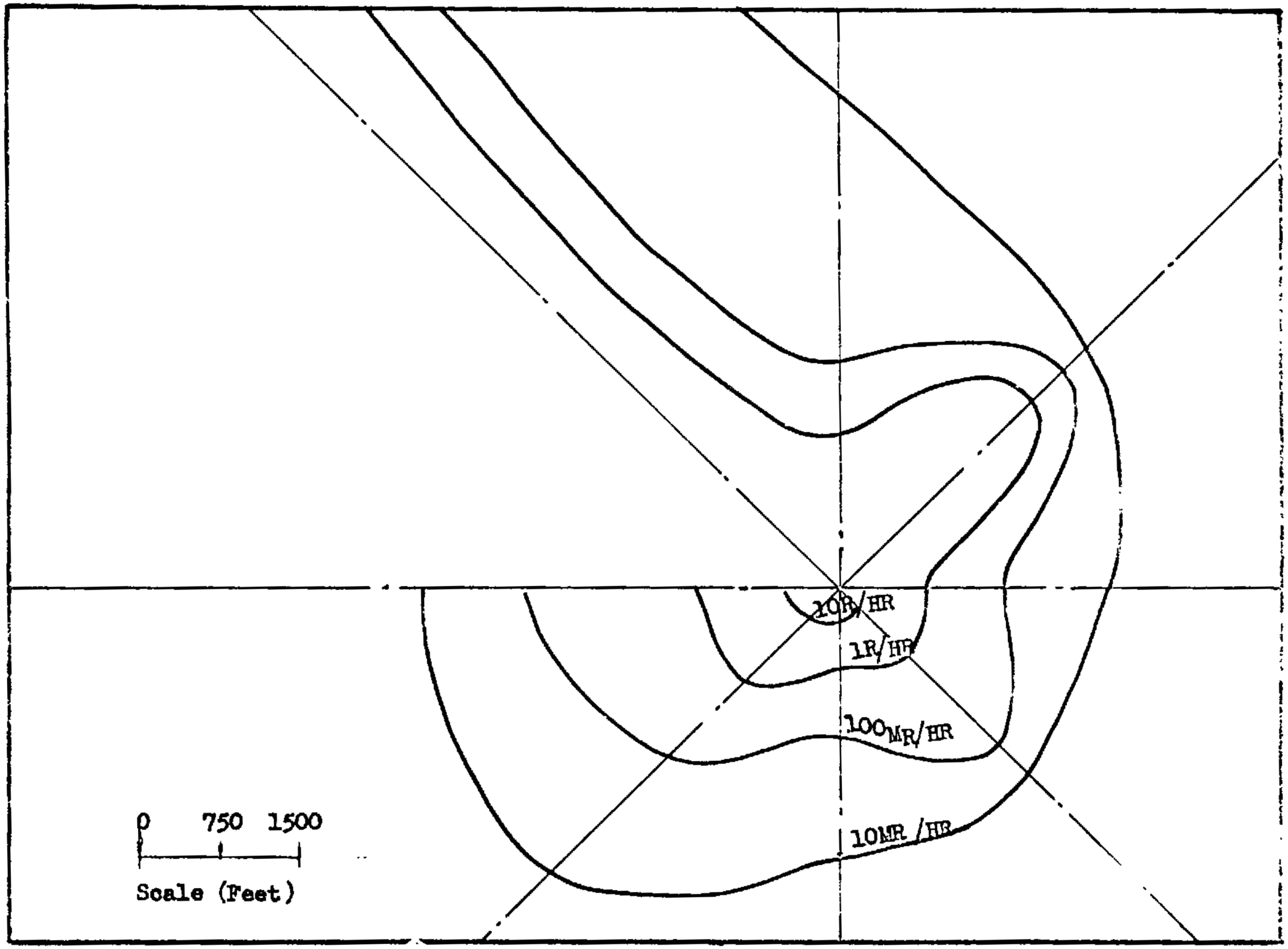

Fig. H.5.1 Isointensity Overlay, 0500 (PST), Shot 8 (See Fig. H.4), 7 June 1952

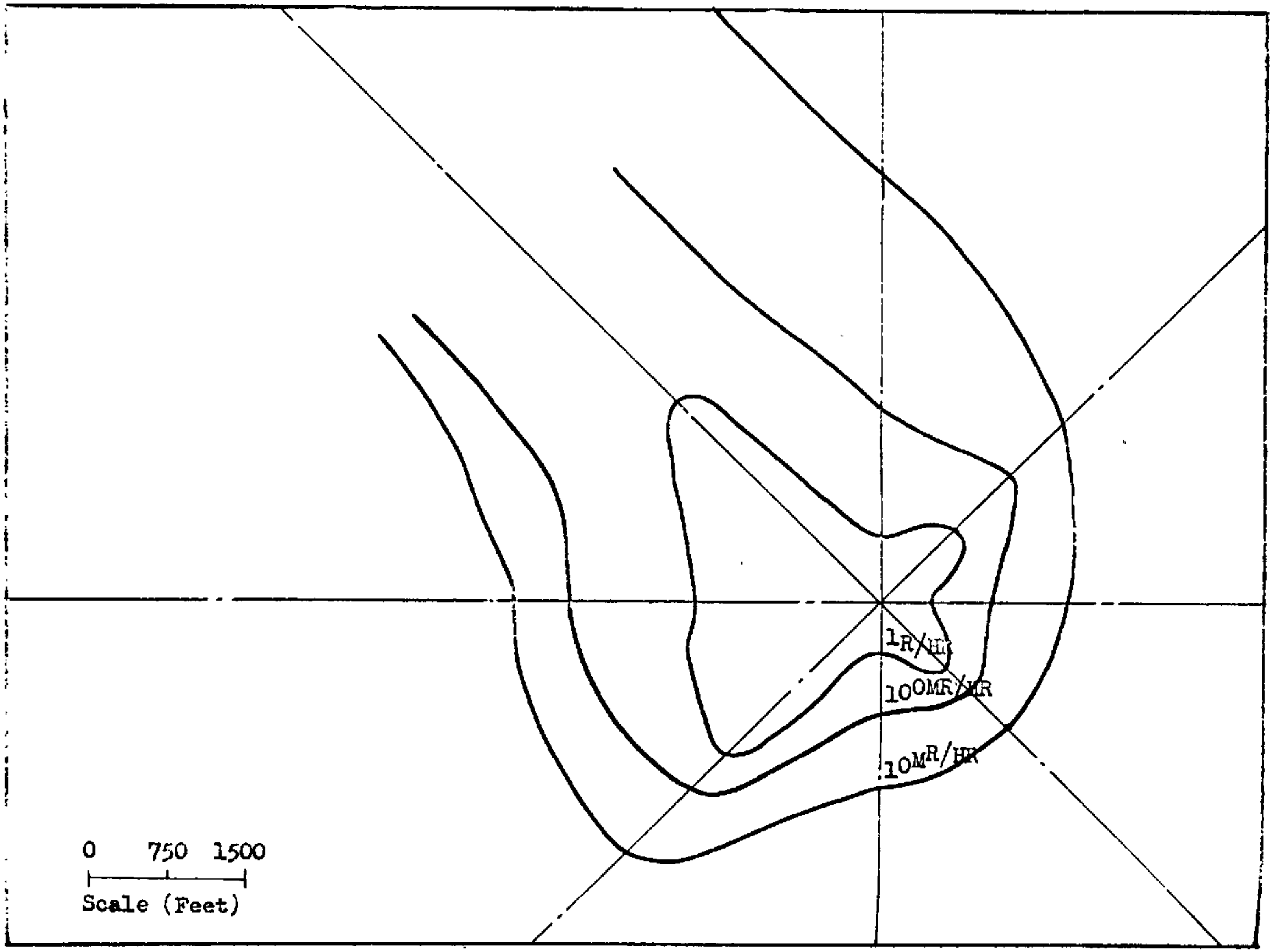

Fig. H.5.2 Isointensity Overlay, 0500 (PST), Shot 8 (See Fig. H.4), 9 June 1952

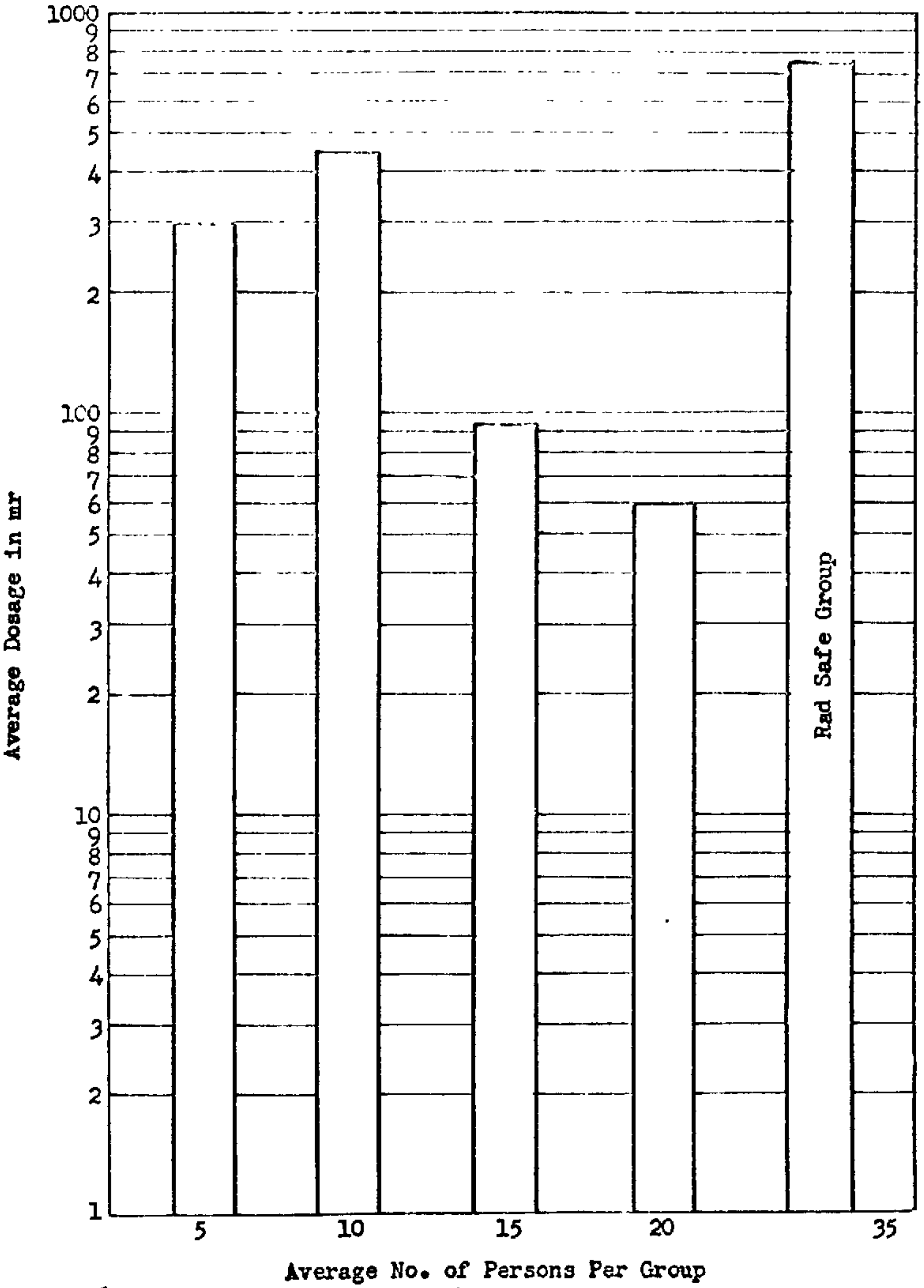

Fig. H.6 Accumulated Dose Report (For personnel Issued Film Badges During Period H-Day to 9 June)

APPENDIX I

EMERGENCY EVACUATION PLANS
OPERATION TUMBLER-SNAPPER

APPENDIX I

EMERGENCY EVACUATION PLANS FOR OPERATION TUMBLER-SNAPPER

I.1 EMERGENCY EVACUATION PLAN FOR PROTECTION OF PERSONNEL AND MATERIEL OUTSIDE THE NEVADA PROVING GROUNDS

I.1.1 Purpose

Instructions herein will be executed to meet emergencies which may arise in connection with Operation TUMBLER-SNAPPER. Actions to meet these emergencies include:

(a) Education of the civilian population as to the type, degree, location of probable hazards, and the length of time such hazards may exist.

(b) Establishment of adequate communications to alert and prepare the civilian population for evacuation and to order such evacuation if required.

(c) Provisions for the monitoring and decontamination of the evacuees and their equipment at the edge of the contaminated area. Extra vehicles, traffic direction, and control will be furnished if needed.

(d) Furnishing guards for the property left behind and protective equipment for the guards.

(e) Arrangements for food and shelter for the evacuees.

(f) Means of informing the evacuees when they may return to their homes.

(g) Provision for payment of the expenses, other than claims, of the evacuation.

I.1.2 Implementation

Pertinent information regarding population centers is as follows:

Population Centers	Population	Miles from Test Area
Rox	30	65
Carp	18	76
Elgin	18	80
Caliente	958	91
Pioche	1389	107
Irrigated Valley of Alamo and Hiko	1200	

I.1.2. Implementation (Cont'd.)

Population Centers	Population	Miles from Test Area
Sharp	10	56
Barclay	12	90
Crestline	12	110
Moapa	20	69

Implementation will be in three phases as follows:

(1) Phase I - Education of the civilian population.
(2) Phase II - Warning, evacuation and care of evacuees.
(3) Phase III - Return of evacuees.

I.1.3 Action to Be Taken During Phase I

AEC representatives will contact local C.D.A., town authorities, etc., during Phase I, to inform the civilian population of the following:

(1) Tests will be conducted in the near future at Nevada Proving Grounds.
(2) Possibility of contamination.
(3) Precautions to be taken.
(4) The manner in which warning will be given, the evacuation conducted and the arrangements for food and shelter.

Prior to a shot the Test Manager may order the stationing of busses in certain communities.

I.1.4 Procedure - Phase II

Following each shot, the Off-Site Monitoring Officer will track the radioactive cloud by both ground and aerial survey teams. As, and if, the cloud approaches a populated community, the Test Manager and Test Director will be kept informed of the expected intensity, time of arrival, the name and location of the community

which may be affected. When the Test Manager considers such action necessary, he will inform the Director, Rad-Safe Unit, to activate Phase II. The following action will then be taken:

(1) If the anticipated intensity is determined by the Test Manager to be of a minor degree, the population will be warned by local monitors to remain indoors, with doors and windows closed, until the area is clear. If this step is necessary, a Rad-Safe Officer, accompanied by an AEC representative, will proceed immediately to the community in question. When the "all clear" is given, the population will be notified as to the decontamination measures to be taken.

(2) If the anticipated intensity is determined by the Test Manager to be of a degree requiring evacuation, the Test Manager will direct the Deputy for Military Participation to execute the evacuation of the area involved. Action taken will depend upon the number of persons affected and the distance they may be required to move. Director, Rad-Safe Unit will assist the Military Deputy to:

(a) Notify state police of the area and towns to be evacuated and shere the evacuees will be sent.

(b) Advise town officials and the nearest local Red Cross of the area of evacuation and the destination of the evacuees.

(c) If sufficient vehicles are not available either on station or in the Mercury Motor Pool, notify Camp Desert Rock of the probable number of vehicles, drivers, and guards required. Camp Desert Rock will immediately dispatch required personnel and equipment to the area designated. Desert Rock Personnel and vehicles will be under control of the Deputy Test Manager for Military Participation.

(d) Notify the local law enforcement agencies and the C.D.A. to assist in the evacuation.

I.1.4 Procedure - Phase II (Cont'd.)

(e) The Rad-Safe Unit will send additional monitors to accompany the evacuees and to furnish protective clothing, and equipment for those people whose duties require that they remain in the contaminated area. They will also supervise in decontamination of personnel.

(f) Credit cards will be issued by the Test Manager entitling the evacuees up to ten dollars ($10) a day credit during the period of evacuation. These cards are not to be valid twenty-four (24) hours after the signal is given for the evacuees to return to their homes.

At such time as the evacuated area is deemed to be safe, the following instructions will be given by the Test Manager:

(1) That the evacuees will be permitted to return home. They will be informed that their credit cards have expired.

(2) Rad-Safe Unit will give instructions as to the methods of decontamination and supervise all decontamination.

(3) A representative of AEC will proceed immediately to community to control the return and make a preliminary survey of damage with a view to elimination of future claims.

I.1.5 <u>Important Phone Numbers</u>

Governor of Nevada	Carson City	307
Civilian Defense Agency	Carson City	87
Civilian Defense Agency	Las Vegas	5600
Red Cross	Las Vegas	1225
Chief of Police	Las Vegas	171
Chief of Police	Rox	Not listed
Chief of Police	Carp	Not listed
Chief of Police	Elgin	Not listed
Chief of Police	Crestline	Not listed
Chief of Police	Sharp	Not listed
Chief of Police	Hiko	Not listed
Chief of Police	Caliente	Not listed
Chief of Police	Barclay	26-W
Chief of Police	Pioche	53

I.1.5 Important Phone Numbers (Cont'd.)

Chief of Police (Deputy Sheriff)	Alamo	5-M
Chief of Police	Moapa	2351
Sixth Army Hdqs.	Presidio of San Francisco	West 16111
State Patrol	Las Vegas	67
Sheriff's Office, Nye County	Tonopah	Not listed
Sheriff's Office, Clark County	Las Vegas	5600

I.2 EMERGENCY EVACUATION PLAN FOR PROTECTION OF PERSONNEL AND MATERIEL IN MERCURY

I.2.1 Purpose

To provide a plan for the orderly evacuation of military and civilian personnel, the protection of property and maintenance of essential services during and after an evacuation of the Mercury area, if such evacuation is determined to be necessary due to radiation hazard.

I.2.2 Implementation

The necessity for evacuation will be determined by the Test Manager. Directives will be given to the Manager, NPG and to the Deputy Test Manager for Military Participation and Support to carry out the evacuation.

I.2.3 Responsibilities

The Field Manager, NPG will be responsible for the coordination of contractors and civilian organization and coordination with the Military Deputy in the carrying out of this plan. The Field Manager will arrange for a suitable warning signal, such as a fire siren, to notify of evacuation. This signal will be used only when there is less than two (2) hours notice to evacuate.

The Security Force, NPG, will carry out the direction of traffic, pedestrian and vehicular, to an assembly point established on the east side of the main road in the following manner:

(1) Owners of civilian cars will drive to access road following routes marked by signs and posted by the Security Force. At a check point near pedestrian assembly area, inspectors will direct the loading of any waiting passengers and send civilian cars on their way with instructions relative to destination.

(2) Personnel not having transportation will proceed on foot to the assembly area on the east side of the main road and await directions of security inspectors as to the boarding of vehicles.

I.2.3 Responsibilities (Cont'd.)

Pedestrians will not use roads but will walk between buildings and well to the side of roads to permit full use of roads by vehicles.

(3) Assigned bus and vehicle drivers will bring busses to pedestrian assembly area and be loaded. After loading, busses will proceed over route designated by security inspectors.

(4) The Security Force will establish routes of evacuation within the camp area and post permanent signs to show the route and speed limits during the emergency. Deputy sheriffs will report to and function under the Security Force.

(5) The Security Force will maintain patrols in the camp area after evacuation to watch for fires, prevent looting and make final check of all buildings for stray people left behind.

(6) The Security Force will go to areas out of hearing of signal to notify of evacuation; this includes transient trailer camps in the vicinity of Mercury.

(7) The Security Force will coordinate with the State Police to clear Highway #95 for evacuation traffic and to keep unessential traffic off the highway to avoid contamination.

The Nevada Company will maintain minimum services after evacuation. Fire Department, Communications, Medical Service, Power Plant, and Water Supply will be maintained by skeleton crews unless otherwise ordered.

Arrangements for food, shelter and medical care will be made by The Nevada Company through the American Red Cross for civilian personnel and by the Test Command and Sixth Army Headquarters for military personnel.

Camp Desert Rock will direct all its evacuation traffic to keep off the main access road, using the back road to move to the highway.

Rad-Safe Unit will provide protective equipment for personnel remaining in Mercury area under the provisions of this plan.

I.3 EMERGENCY EVACUATION PLAN FOR PERSONNEL OF THE CONTROL POINT AND THE MANNED STATIONS WITHIN THE IMMEDIATE TEST AREA

I.3.1 Purpose

The purpose of this plan is to provide for the safe,

I.3.1 Purpose (Cont'd.)

orderly evacuation of the CP, Rad-Safe Building, and manned stations in the vicinity. Such evacuation might be necessary in the event of a crash landing of the strike airplane, a sudden and unpredicted wind shift, or miscalculated point of detonation of the weapon.

I.3.2 Preparation

At approximately H-3 hours, the Test Director will brief the Security Inspector in charge of the CP as to the status of the manned stations of the CP and test area.

I.3.3 Implementation

When the Test Manager makes the decision to evacuate the CP and the manned stations in its vicinity, evacuation will be accomplished as follows:

(1) Evacuation notice will be given over the Public Address System in Building No. 1 of the CP and by telephone to Building No. 2 and to the various manned stations, by direction of the Test Manager. In addition to this warning, two radio-equipped vehicles with a driver and radio operator will be dispatched by the Rad-Safe On-Site Monitoring Office to patrol the main North-South road, collecting pedestrians that may be encountered and to insure that all manned stations have been notified of the evacuation.

(2) With due consideration to the probability that the disaster aircraft will be in radio contact with the strike aircraft, and all other factors, the Test Manager will determine whether or not the CP radio station personnel will evacuate.

(3) It is the responsibility of each unit having personnel in the CP area to insure that adequate transportation is available to evacuate all of the personnel in the unit, by one way movement. Drivers of vehicles will be instructed to be ready for evacuation which may be ordered at any time from H-1½ to H-6. The vehicles will be parked in such a way as to facilitate rapid loading and departure of personnel. Drivers will stand by their respective vehicles and will start engines upon receiving the evacuation notice. Security guards will supervise the departure of vehicles to the extent of assuring that vehicles do not leave the area partially loaded with the result that personnel may be left without transportation.

(4) The security inspector will make a check of all buildings and areas covered in briefing, following apparent evacuation of those areas to assure that evacuation has been complete.

I.3.3 Implementation (Cont'd.)

(5) The fire truck and ambulance will stand by at the CP gate subject to instructions from the Test Manager. In the absence of specific instructions, these vehicles will precede the vehicles containing the security inspectors.